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ASSISTED WRITING SKILLS PRACTICE ON L2 WRITING

by

Evelyn M. Rogers

A dissertation submitted to the faculty of the

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DEDICATION

To my husband

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ABSTRACT

The purpose of this dissertation is to compare the quantity and quality of writing produced by L2 students after participating in either (1) collaborative, computer-mediated communication (CMC), or (2) non-collaborative, computer-assisted writing skills practice. The subjects for this study were 42 students enrolled in French classes at the U. S. Air Force Academy. The CMC treatment consisted of 45 minutes of collaborative, simultaneous written "discussion" among student clusters of 3 or 4 students. The writing skills group focused on vocabulary building, grammatical review, and format review, using the French writing software program, *Système-D*. A computerized text analysis program, as well as experienced foreign language instructors then analyzed students' compositions. This study also addressed learner attributes (including gender, grade point average [GPA], and personality variables) and L2 proficiency and their interaction with the two computer-based contexts. Finally, it assessed learners' attitudes toward each of the two pre-writing activities.

Results revealed that the effects of participating in either collaborative CMC or non-collaborative writing skills practice on L2 writing, in terms of the 6 variables considered (total number of words, grammatical accuracy, lexical density, lexical diversity, syntactic complexity, and overall writing quality) were minimal. While gender did not have a significant impact on quantity and quality of writing in the two contexts considered, GPA and language proficiency were significantly correlated with grammatical accuracy and overall writing quality. Selected personality variables had minimal effects on L2 writing.

While subjects were markedly interested in both CMC and *Système-D*, quantitative as well as qualitative analysis of the attitude questionnaire showed a clear preference for *Système-D* over CMC.

This study showed that students benefited from both types of pre-writing activities. The CMC group had the benefits of interaction and increased target language production, while the computer-assisted writing skills group benefited from access to a computerized data base of grammar, vocabulary and phrases for their compositions. Overall, students had positive attitudes toward both computer-based activities. If positive attitudes lead to increased motivation and enhanced second language development, it follows that these computer-based activities should be integrated into the traditional second language acquisition syllabus.

CHAPTER 1
INTRODUCTION

Introduction

While a great deal of enthusiasm exists for implementation of computer-based

activities in language learning classrooms throughout the country, there is reason to be

cautious about swift and widespread use in all contexts. As with any classroom activity,

we should have reasonable justification and theoretical grounding for our decisions

concerning technology. Moreover, according to Bush (1997) in the most recent volume

of the ACTFL Foreign Language Education Series:

> It is not possible to implement technology-enhanced language learning materials
> without some form of a theory base, be it informal or formal, widespread or
> idiosyncratic. Stated another way, by definition, all materials implement some
> particular model of what language is and how it is learned. The technology itself, like
> most other tools, it theory-neutral. It stands ready to be employed in consonance with
> the particular theory sustained by the instructional designer who is responsible for the
> materials development process (p. 313).

Therefore, whether we acknowledge it or not, when we use computer-based activities in

our classrooms, we are being guided by theoretical principles about how languages are

learned. The computer is an instrument offering numerous benefits in a variety of

language learning activities, but in and of itself, does not offer justification for our

actions. Just as Bush (1997) pointed out the "theory-neutral" quality of the computer,

Johnson (1991, p. 67) noted:

> … the computer itself does not determine interpersonal second language use and
> interaction patterns. Rather, the computer is only one element in a complex language-
> use situation. Research in the social aspects of computer use needs to move, then,
> from a search for the average social effects of the medium, to a recognition of, and an
> accounting for, the complex social nature of computer learning environments.

It is important therefore to consider the theoretical underpinnings germane to this study. This review is by no means exhaustive, due to the complexity of the language learning phenomenon. Furthermore, while a great number of second language acquisition theories have been advanced by various scholars in our field, we have yet to arrive at a consensus on how second language learning takes place. This ongoing debate leads to disharmony in the classroom. According to Bush (1997, p. 313):

> Frequent changes in trends and fads in language-teaching pedagogy are well known throughout the profession. On the other hand, many learners become proficient in a second language despite significant discomfort inflicted by well-meaning language teachers. Because such a condition exists, there is no reason to think that the field is close to widely accepting any single model of what language is and how it should be learned.

This ongoing debate over what constitutes effective language teaching is evidenced in a historical perspective of the teaching of second language writing. This chapter will first outline the history of foreign language writing instruction, from the grammar-translation era to present-day computer-based writing. Next, it will address important notions about writing, including the importance of writing instruction, and a process v. product orientation of writing instruction. Third, it will address theoretical underpinnings for this study, including a discussion of ambiguities between interactional and other acquisitional concepts. Last, a general plan for this study will be presented.

A historical perspective

The history of writing in second language instruction has taken several twists. In the grammar-translation era, writing instruction focused on the mastery of the structural elements of language. According to Greenia (1992), "Most writing done in foreign

language classrooms in the past consisted of transcription exercises on the phrase or sentence level, exercises that did not train students to frame extended arguments and expositions. It certainly did not require critical thinking" (p. 30). In the audio-lingual era, spoken language was considered of utmost importance. Writing was seen as a secondary skill, and not one that was crucial to foreign language proficiency development. Davis (1994) even suggests that "the common order of the four skills (speaking, listening, reading, and writing) seems to indicate the priority rating of the skills in the foreign language classroom" (p. 141). But despite the lack of attention given in the past to writing as a means of second language proficiency development (Greenia, 1992; Raimes, 1991; Valdés, Haro, & Echevarriarza, 1992), current trends emphasizing proficiency in all four skills have caused another shift in the value placed on writing. Gass and Magnan (1993, pp. 157-158) assert, "Current L2 research, in fact emphasizes the importance of both speaking and writing for their intrinsic value in contributing to acquisition." This growing importance placed on writing skills is reflected by an increased number of studies devoted to understanding the foreign language writing process.

Increased awareness of the importance of writing skills in foreign language proficiency development is also evident in technology-based language learning studies. Research into the effectiveness of the computer in second language writing instruction has reflected the development and prevalence of various computer applications. The first research efforts focused on the effectiveness of feedback for grammatical exercises, as they were considered essential for the development of second language writing

proficiency. The focus shifted as foreign language writing instructors followed the lead

of native language (L1) writing instructors to use the computer for word-processing.

Rapidly developing computer capabilities led to a third shift: focusing on the possible

benefits to writing competency by using the computer to facilitate writing and editing.

A specific example of this type of computer-assisted writing research is based on

advantages and disadvantages of computer conferencing, or computer-mediated

communication (CMC), in the foreign language classroom. Johnson (1991)

acknowledged the importance of such technological developments when she wrote:

> Rather than isolating students and promoting asocial behavior, as many have feared,
> there is a growing body of evidence that computer use can promote new ways of
> working together, productive peer teaching, as well as high-quality social and
> academic task-based interaction, and that these kinds of interaction are related to
> higher levels of interest, motivation, and achievement (p. 65).

Johnson alludes to the benefits of interaction and collaboration among students as distinct

benefits of using computer-based activities. Recent research studies focused on

collaboration among students via computer-conferencing (Kern, 1995; Beauvois, 1994;

Ittzes, 1997) have suggested that such activities could lead to enhanced second language

learning. The purpose of this dissertation is to investigate the effects of two different

contexts: one emphasizing collaboration, and the other emphasizing individualized

instruction, on second language writing among French foreign language learners.

Notions about writing

Two important and related issues surrounding foreign language writing instruction are

(1) recognized goals for the instruction, and (2) the "process v. product" debate. They are

presented here in order to provide a framework for understanding methods used in the present study.

The historical development of writing and its shift from form-focused to content-based writing, falls in line with the variety of recognized goals for writing instruction. In her article entitled "Why write? From purpose to pedagogy," Raimes (1987) offers two essential questions surrounding the issue of writing in the foreign language classroom: "Why do language teachers ask their students to write? and Why do students of a second language need to write?" (p. 36). She then outlines several reasons for incorporating writing into the foreign language curriculum:

1. to have learners imitate some model of writing
2. to train learners in the use and manipulation of linguistic and rhetorical forms
3. to reinforce material that students have already learned
4. to improve learners' writing fluency
5. to encourage authentic communication whereby the writer really wants to impart the information and the reader is genuinely interested in receiving it, and
6. to learn how to integrate all the purposes above, with the emphasis on improving the whole performance, not just one of its components.

Obviously, instructors must vary writing activities in order to accomplish these very different goals for writing. "Manipulation of linguistic and rhetorical forms," also known as "writing as a support skill" (O'Maggio Hadley, 1993; Scott, 1996), might consist of "copying, taking notes, writing lists, and filling in blanks" (Scott, 1996, p. x). These types of activities may be particularly useful in the early stages of foreign language writing development. Writing for communicative purposes, on the other hand, entails "creating meaning through the arrangement of words, sentences, and paragraphs" (Scott, 1996, p. x). Obviously, "creating meaning" and moving beyond sentence-level

construction would be more appropriate after a certain competency in the foreign language has been attained.

A second important issue surrounding foreign language writing instruction is the on-going "process v. product" debate. This debate among second language professionals stems from a similar debate within L1 writing instruction. A "process-oriented" approach concerns itself with the various stages a student goes through (from brainstorming about ideas and pre-writing activities to producing the final draft) in the composition process. Writing is not considered an isolated activity performed by the student and assessed by the instructor, but rather an opportunity for students to interact with others, including their peers and their instructor, to assist with the intricacies of writing. According to the process approach, writing is not the progressive learning of how to connect words, phrases and sentences, but rather the process of learning "how to select and organize experience according to a certain purpose," which requires "active thought" (Arapoff, 1967, p. 33). In discussing writing instruction for ESL students, Arapoff (1967, pp. 33-34) emphasizes the development of critical thinking skills through writing:

> When writing, the students must keep in mind their purpose, think about the facts they will neèd to select which are relevant to that purpose, and think about how to organize those facts in a coherent fashion. The process of learning to write is largely a process of learning to think more clearly.

From the process-oriented perspective, therefore, learning to write involves learning higher order thinking skills.

A "product" approach, on the other hand, focuses strictly on the finished product. This approach in foreign language instruction mirrored several of the practices used in L1 product-oriented instruction:

1. the three- or five-paragraph model;
2. simplistic assumptions about the organization and ordering of information;
3. the typical one-draft writing assignment;
4. the assumption that each student should be working alone, or only with the instructor on summative feedback;
5. reliance on grammar/usage handbooks and lectures;
6. the linear composing model based on outlining, writing, and editing ... (Grabe & Kaplan, 1996, p. 86).

Students are expected to overcome obstacles in the writing process on their own. The instructor's primary purpose is to assign a grade to the completed composition. The cycle is then complete, and then both students and instructor move on to the next assignment.

One of the main flaws in the "process v. product" debate is that writing can be considered a black and white, all or nothing, dichotomous issue. Students do not, however, go through the "process" of writing a composition without producing a final product. Similarly, written products do not come into existence without the student's (recognized or unrecognized) participation in the writing process. Emphasis toward the process end of the scale or the product end seems to be an important part of this debate, and yet foreign language writing professionals should not lose sight of the following: (1) "process" does not take place in the absence of "product," and (2) "product" does not come about in the absence of "process."

It is important to note at this point that this particular study is focused on process. The researcher is most interested in *how* the students arrive at the final product. To do this,

both "product" and "process" are taken into account: analysis is performed on the end-product in the writing cycle in order to determine the effectiveness of the process.

Theoretical background

The previous two sections, a historical perspective of writing and notions about writing, must be placed in the overall context of second language acquisition theory. This section will address theoretical underpinnings for this study, including a discussion of ambiguities between interactional and other acquisitional concepts.

In an attempt to explain and understand the very complex issue of language acquisition, theorists have fallen at opposite ends of a mentalist – empirist continuum. On the one hand were theorists such as Noam Chomsky who believed that people are born with the ability to learn languages (Chomsky, 1959). Chomsky based his belief on several observations. The first is that all "normal" children (excluding those with brain disorders, for example) acquire their L1 effortlessly and successfully. Children quite often produce sentences that they have never heard before. Their creative, unique utterances lend support to the argument that they are making use of their specific "language faculty."

Chomsky also felt that correction played a very limited role in child language acquisition. In his opinion, errors in children's speech were often not corrected, and yet the child continued to acquire language successfully.

Finally, children were also observed overgeneralizing rules that they had acquired, including the use of "-ed" being added to form the past tense of verbs, or "-s" to form plurals of nouns.

Chomsky sums up his beliefs about language acquisition as follows:

As far as acquisition is concerned, it seems clear that reinforcement, casual observation, and natural inquisitiveness (coupled with a strong tendency to imitate) are important factors, as is the remarkable capacity of the child to generalize, hypothesize, and 'process information' in a variety of very special and apparently highly complex ways which we cannot yet describe or begin to understand, and which may be largely innate, or may develop through some sort of learning or through maturation of the nervous system. The manner in which such factors operate and interact in language acquisition is completely unknown (Chomsky, 1959, p. 43).

Chomsky's theory developed due to his sharp criticism of B.F. Skinner's behaviorist theory of language learning. Skinner attempted to explain language development in much the same way as animals learned simple response behaviors in "Skinner's boxes." Skinner discovered that if a rat received a food pellet each time the animal pushed a bar, the behavior would be "reinforced," and performed successfully in subsequent settings. Skinner carried his theory over to explain the complex process of language acquisition. This behaviorist approach led to the belief that repetitive drill and practice exercises were the most effective means of language acquisition. It became the justification, in fact, for the Audio-Lingual method, popular in the U.S. during the 1950's and 1960's. According to this method, "Language learning is a process of habit formation. The more often something is repeated, the stronger the habit and the greater the learning" (Larsen-Freeman, 1986, p. 40).

Chomsky's critique of this behaviorist explanation and his revolutionary ideas about how languages are learned opened the doors to a variety of other language learning theories. By the 1970's, while the field of psychology grew more interested in interpersonal relationships, linguists began "searching ever more deeply for answers to the nature of communication and communicative competence and for explanations of the interactive process of language" (Brown, 1994, p. 14). Cooperative learning and "communicative" language learning activities became buzzwords within the profession. Brown (1994, p. 15), asserts:

> Indeed, the single greatest challenge in the profession is to move significantly beyond the teaching of rules, patterns, definitions, and other knowledge 'about' language to the point that we are teaching our students to communicate genuinely, spontaneously, and meaningfully in the second language.

The push to develop activities that foster "genuine, spontaneous, and meaningful" communication has transcended both the traditional and computer-based language learning classroom. This dissertation will investigate the benefits of one such communicative activity in the computer medium.

Much of the support for communicative tasks and teaching methods in the classroom today comes from discourse interaction theory. The basic claim of this theory is that negotiations for meaning lead to subsequent modifications of a learner's interlanguage, and therefore are essential to language development. In his descriptive article on this topic, Allwright (1984, p. 156) goes so far as to suggest "considering interaction in the classroom not just as an aspect of 'modern' language teaching methods, but as *the* fundamental fact of classroom pedagogy." Allwright (1984, pp. 157-158) offers four reasons for "getting students communicating" in the classroom:

(1) Communication practice in the classroom is pedagogically useful because it represents a necessary and productive stage in the transfer of classroom learning to the outside world.

(2) The process of communication is a learning process. We learn *by* communicating, especially in language learning, where (the argument runs) it is by *using* the means of communication, in solving communication problems, that we are not merely practice communicating, but also *extend* our command of the means of communication, the language itself.

(3) Communication encourages 'involvement' or 'investment.' Topics which are relevant to the learners will result in greater participation among all class members.

(4) Learning may be enhanced by peer discussion. Students may learn directly from each other, or, more likely, they will learn from the very act of attempting to articulate their own understanding.

A thorough review of research focused on discourse interaction theory is found in Ellis' (1994, pp. 243-291) chapter on "Input and interaction and second language acquisition." Ellis first describes child language research in L1, which forms the basis for later developments in second language acquisition (SLA) research. Next, Ellis examines the four common approaches used in SLA research concerning discourse interaction theory. They are: (1) input frequency, (2) comprehensible input, (3) learner output, and (4) collaborative discourse. The last three approaches are of considerable importance to this particular research project.

The notion of comprehensible input was developed as part of Krashen's Input Hypothesis (Krashen, 1985, 1989). The hypothesis consisted of the following five claims:

1. The Acquisition-Learning Hypothesis: 'acquisition' is subconscious, while 'learning' is a conscious process that results in 'knowing about' language.
2. The Natural Order Hypothesis: we acquire the rules of language in a predictable order, some rules tending to come early and others late.
3. The Monitor Hypothesis: Our ability to produce utterances in another language comes from our acquired competence, from our subconscious knowledge. Learning, conscious knowledge, serves only as an editor, or Monitor.

4. The Input Hypothesis: We progress along the natural order (hypothesis 2) by understanding input that contains structures at our next 'stage' – structures that are a bit beyond our current level of competence. Two corollaries:
   (a) Speaking is the result of acquisition and not its cause.
   (b) If input is understood, and there is enough of it, the necessary grammar is automatically provided.
5. The Affective Filter Hypothesis: Comprehensible input is necessary for acquisition, but it is not sufficient. The acquirer needs to be 'open' to the input. The 'affective filter' is a mental block that prevents acquirers from fully utilizing the comprehensible input they receive for language acquisition (Krashen, 1985, pp. 1-3).

The last two claims are particularly relevant to the present study. The fourth claim

addresses the need to provide input which Krashen classifies as "i + 1." Krashen

advocates teaching just beyond the students' current level of understanding to foster

language development. This claim suggests that context plays a significant role in

making input comprehensible. According to Krashen, there is no need to emphasize

specific linguistic concepts; learners will acquire them automatically if there is a

sufficient amount of comprehensible input. The Input Hypothesis (as well as the other

four claims) have received a great deal of criticism in the literature (see Gregg, 1984;

Long, 1983; McLaughlin, 1978, 1987; White, 1987). Long's (1983) contention was that

focused instruction does in fact play a role in foreign language proficiency development.

After reviewing 12 studies addressing the question "Does second language instruction

make a difference," Long (1983, p. 359) concludes that "there is considerable (although

not overwhelming) evidence that instruction is beneficial 1) for children as well as adults,

2) for beginning, intermediate, and advanced students, 3) on integrative as well as

discrete-point tests, and 4) in acquisition-rich as well as acquisition-poor environments."

This would imply an advantage for those students in the present study who focus

specifically on acquisition of vocabulary terms, phrases and grammatical points, rather than free-flowing communication.

The major shortcoming in Krashen's claim concerning comprehensible input is his failure to provide precise definitions of "i" or "i + 1." This claim is both valuable and problematic for the present study. If context does indeed play a significant role in making input comprehensible (which in turn leads to greater acquisition), then a computer-based activity that focuses on meaning, rather than structural concepts, would seem to enhance the acquisition process. On the other hand, Krashen's emphasis on comprehension, rather than production, is problematic, in that the present study assumes the importance of production in the second language acquisition process.

The last claim alludes to Krashen's well-known concept of an "affective filter." If learners have low affective filters, they are more likely to "let in" the necessary comprehensible input for proficiency development. By contrast, if a student's affective filter is high, due to factors such as anxiety or lack of confidence, comprehensible input will be blocked, and proficiency development will be hindered. According to Krashen, anything that can be done to reduce anxiety in language learning contexts will enhance the acquisition process. As mentioned above, the notion of an affective filter has been widely criticized (see Gregg, 1984; Long, 1983; McLaughlin, 1978, 1987; White, 1987). Specifically, McLaughlin (1987, p. 56) writes:

> The Affective Filter Hypothesis is also of questionable validity because Krashen has provided no coherent explanation for the development of the affective filter and no basis for relating the affective filter to individual differences in language learning.

While this is a valid criticism, there is also widespread agreement on the importance of affective factors in second language learning. Classroom activities that reduce anxiety and instill confidence in the learner are considered invaluable. Affective factors will be considered in the present study to determine if one of the two computer-based activities leads to more positive attitudes toward both the pre-writing and composition phases of L2 writing.

It is important to note that Krashen (1985) felt that the Input Hypothesis was also applicable to writing. He wrote, "Good writers, it has been found, have done more reading for their own interest and pleasure than poor writers, and programmes that get students 'hooked on books" help develop writing skills" (Krashen, 1985, p. 19). This natural link between reading and the development of writing skills also plays a role in the present study. One of the computer-based activities used as a pre-writing activity involves reading and comprehending before progressing to the more difficult stage of production. According to Krashen's theory, it seems logical to assume that this type of "reading for meaning" would enhance students' production to a greater extent than a computer-based activity focused on the acquisition of vocabulary, phrases and discrete-point grammar.

In addition to comprehensible input, some researchers have emphasized the need for comprehensible output to foster second language development. Learner output studies, including Swain (1985) and Harley, Allen, Cummins, and Swain (1990), have shown that second language acquisition occurs when learners are "pushed" into producing the target language. Swain (1985) conducted a study of native speakers of English who were

studying French in immersion programs in Canada. The children in this study received a tremendous amount of comprehensible input over the course of their seven years of French studies. Swain's (1985) data collection methods included three instruments: (1) a structured interview, (2) a multiple-choice test, and (3) a written production task. The three instruments were aimed at assessing grammatical, discourse, and sociolinguistic competence. Analysis of the data showed that, despite the amount of exposure to comprehensible input, the students were far from achieving native-like performance in French. Swain (1985, p. 247) wrote, "In short, what the data suggest is that comprehensible input will contribute differentially to second language acquisition depending on the nature of that input and the aspect of second language acquisition one is concerned with." Her contention was that Krashen's (1985) notion of comprehensible input focused specifically on grammatical competence, and did not take into account other aspects of communicative competence, such as discourse and sociolinguistic competence.

According to Swain (1985, pp. 248-249), there are at least three roles of comprehensible output:

(1) it provides the opportunity for meaningful use of one's linguistic resources,
(2) it provides the opportunity to test out hypotheses,
(3) by using the language, as opposed to simply comprehending the language, it may force the learner to move from semantic processing to syntactic processing.

Swain suggests, therefore, that lack of comprehensible input was not the reason the immersion students in her study were not achieving native-like performance. She contends that they were not being given sufficient opportunities to produce the target language, and were not being "pushed in their output" (ibid., p. 249). Without such

incentive, learners may stagnate and not achieve greater levels of second language proficiency.

Just as Krashen's (1985) notion of comprehensible input can be applied to the productive skill of writing, so too, can Swain's (1985) theory of comprehensible output. Students must be given the opportunity to produce the target language in written form, and must be "pushed in their output" in order to develop second language writing proficiency. Both of these concepts were present in the computer-mediated discussion groups, used as one of the pre-writing activities in this study.

The theory reviewed in this section is not meant to be all-inclusive. Major theories of significant relevance to this study were reviewed in order to provide a framework for the conceptualization, design, and implementation of this study.

General plan and importance of this study

Technology is advancing at such an incredible pace that is hard to keep up with its ever-expanding capabilities. Schools across the country, from elementary schools to universities, are making use of computers in all academic areas. Naturally, research on computer use in the classroom has also increased tremendously. In recent years, related foreign language studies have focused on the effectiveness of computer-assisted language learning (CALL) exercises versus "traditional" pen-and-paper activities. However, we are now well beyond the question of whether or not computers are effective in language teaching. In fact, several years ago Dunkel (1991) made the call for a change to this focus of the research. She wrote:

> Future CALL researchers should … forgo conducting the traditional media-evaluation
> study – the study examining the effects of presenting the L2 lesson via computer

versus presenting the L2 lesson by teacher/book/audiotape/videotape. They must instead begin to investigate a wide range of CALL lesson types, a number of different types of computer-student interactions (e.g. single-student tutorial, couple/group networking), a host of learner attributes (…) and aptitudes (e.g. cognitive style; L2 proficiency) that interact with the CALL treatment, and a wide range of the educational outcomes of CALL (e.g., speaking, reading comprehension skill development) (Dunkel, 1991, p. 21)

This study is a step in that direction. It examines differences in two type of computer-assisted language learning activities: one focused on student networking and the possible benefits of interaction, and the other focused on individual student-computer interaction. The effects of collaboration in the computer-based learning environment of are primary importance. This study also addresses learner attributes (including gender, grade point average, and personality variables) and L2 proficiency and their interaction with the two computer-based contexts. Finally, this study deals with an important language learning outcome in CALL-related studies: that of writing.

An outline of this dissertation is as follows: Chapter 2 will provide an overview of the applicable background literature on the following topics: (1) L2 writing theory (including the use of writing skills for proficiency development), (2) interaction theory, (3) computer use and L2 writing, and (4) individual learner differences. Chapter 3 will explain the research design, to include research site and subjects, data collection methods and instruments. It will also detail data analysis procedures and statistical tests used to answer the research questions. Chapter 4 will present the results of the data analysis procedures and statistical tests. Chapter 5 will provide an evaluation of the obtained results, the limitations of the present study, and suggestions for future research.

The specific research questions investigated in this study are as follows:

(1) What are the effects of collaborative computer-mediated discussion and non-collaborative computer-assisted writing skills practice on L2 writing?

"Effects" will be described in terms of five variables: (1) grammatical accuracy, (2) lexical density, (3) lexical diversity, (4) syntactic complexity, and (5) overall writing quality.

H_o: There will be no differences in the compositions produced after collaborative computer-mediated discussion and non-collaborative computer-assisted writing skills practice.

(2) How do individual learner differences (including age, gender, major, and GPA) relate to quantity and quality of performance in the two contexts?

(3) How do personality factors relate to quantity and quality of performance in the two contexts?

(4) How does language proficiency relate to quantity and quality of performance in the two contexts?

(5) What are students' attitudes toward the two pre-writing activities used in this study: (a) collaborative computer-mediated discussion and (b) non-collaborative computer-assisted writing skills practice?

An additional research question having to do with a meta-analysis of the research tools used in the study will also be addressed:

(6) What are the advantages and disadvantages of using computer text analysis programs in assessing L2 texts?

Definitions of some of the specialized terms used throughout the dissertation are as follows:

Foreign language/second language/(L2) – "A foreign language is a language which is not the mother tongue of a speaker" (Crystal, 1992, p. 140). A second language is also one which is not the mother tongue of a speaker, but this designation is sometimes reserved for those languages that have a "special status within a country (such as English used as a second language in Nigeria)" (Crystal, 1992, p. 345). These terms will be used interchangeably throughout this dissertation, and will often be abbreviated as "L2."

English as a Second Language (ESL) – refers to the learning of English by a non-native speaker within the target language context. Immigrant workers, living in the United States, for example, might take ESL classes in order to communicate at work or at school, but use their native language to communicate with friends or family members.

Computer-mediated communication (CMC) – synchronous computer conferencing, in which participants' written messages are immediately available to all other participants in their conference.

Asynchronous computer communication – refers to computer communication in which there is some time delay between an initial message and a response. E-mail messages and bulletin board messages are examples of this type of communication.

Système-D – a French writing software program. "This is program is a fully supported and documented bilingual word processor with an interconnected set of language reference materials, including a bilingual dictionary, verb morphology, examples of usage, and supplementary information on structure, word families, and functional topics" (Noblitt & Bland, 1991, p. 121)

CHAPTER 2
REVIEW OF THE LITERATURE

Introduction

The purpose of this study is to compare the quantity and quality of writing produced by L2 students after participating in either (1) collaborative, computer-mediated communication, or (2) non-collaborative, computer-assisted writing skills practice. Chapter 1 provided the rationale, the theoretical basis, as well as the research questions for this study. Based on the research questions presented, this chapter will provide an overview of the applicable background literature on the following topics: (1) L2 writing theory (including the use of writing skills for proficiency development), (2) interaction theory, (3) computer use and L2 writing, and (4) individual learner differences.

L2 Writing theory

According to Silva (1990, pp. 11-17), there have been four predominant approaches to the teaching of L2 writing over the past 50 years: (1) the controlled composition approach, (2) current traditional rhetoric, (3) the process approach, and (4) English for academic purposes.

The controlled composition approach mirrored aspects of the dominant foreign language teaching method of the 1950's and 1960's: the audiolingual method. Due to the prevalent belief in structural linguistics that "language is speech", writing was considered of secondary importance and a tool for reinforcement of oral capabilities (Silva, 1990, p.12). Learners focused on imitations and manipulations as a means of acquiring second language writing proficiency.

The current-traditional rhetoric paradigm emerged from the realization that English as a second language (ESL) students needed to produce extended written discourse. Emphasis here, according to Silva (1990, p. 14) was on "logical construction and arrangement of discourse forms." Students were rewarded for their ability to conform their own sentences and paragraphs to prescribed models presented by the instructor.

The process approach was generated due in large part to negative reaction to controlled composition and current traditional rhetoric approaches in L1 instruction. Writing was seen as a "complex, recursive, and creative process, similar in its broad outlines for L1 and L2 writers" (Silva, 1990, p.15). Teachers are considered guides or facilitators of writing within this approach, and assist students with multiple drafts, peer reviews, and editing and revising of their compositions. The focus is no longer on the finished product, but rather on the "generating, formulating, and refining one's ideas" or "the process of discovering meaning" (Zamel, 1982).

A fourth approach is English for academic purposes. Opponents of the process approach felt that foreign language students (particularly ESL students) were disadvantaged by an approach that did not prepare them adequately for the writing standards required by American universities. Students were thus coached in the various writing genres indicative of university-level academic writing.

However, while the field of second language acquisition continues to make small strides in understanding the foreign language writing process, we have yet to develop a comprehensive theory of L2 writing (Valdés, G., Haro, P. & Echevarriarza, M. P., 1992; Silva, 1993). A great deal of confusion still exists. While numerous studies have shown

the benefits of a process approach to writing (Susser, 1994; Zamel, 1982; Arrendondo & Rucinski, 1994), others point towards specific skill development, including vocabulary learning (Koda, 1993) and sentence combining (Johnson, 1992), for achieving L2 writing proficiency. Grabe and Kaplan (1996) assert that "most writing instruction is still oriented around 'current traditional' approaches" and that the majority of textbooks used in the classroom "while advertised as process oriented, do not typically emphasize purposeful writing activities" (p. 31). Silva (1990) concurs, adding, "one could make a strong case for the notion that the current-traditional approach is still dominant in ESL writing materials and classroom practices today" (p. 15).

While there is still a great deal of debate concerning the most effective means of writing instruction, a review of the literature seems to show a consensus on at least two aspects of foreign language writing: (1) the complexity of the composing process (Raimes, 1991; Scott, 1996; O'Maggio Hadley, 1993), and (2) the difficulty in evaluating L2 writing (Carlson & Bridgeman, 1986; Hamp-Lyons, 1990; Henry, 1996). These two topics will be described in detail in the following two sections.

Recognition of the complexity of the composing process

While few researchers would argue with the difficulties inherent in the foreign language writing process, each discusses the issue from a slightly different standpoint. Raimes (1991), for example, feels that the complexity of writing stems from the four elements present in any writing situation: "form, the writer, context, and the reader (p. 251). As second language writing instructors, we cannot focus solely on one of the elements, and disregard the rest.

In contrast, Scott's (1996, p. 51) discussion of the complexity of writing emphasizes "the complexity of cognitive skills" used in generating ideas in L2 writing. She claims, "students are unlikely to distinguish consciously between long-term memory information on the topic and information on the language of expression," which may in turn "impede the idea-generation phase of the FL writing process" (p. 51). To compound matters, ideas may not always be stored as words. They may originally be stored as ideas, feelings or images. Scott points out that L2 students "must first translate their feelings, images, or ideas into words, and second, those feelings, images, and ideas must be expressed in the target language" (p. 51). Obviously, this process of idea generation is difficult enough for the L1 writer, let alone the L2 writer who has the additional burden of expression in the target language.

Finally, because of the complexity of the FL writing process recognized in the literature, Kroll (1990) feels that as FL instructors, we must be sensitive to the difficulties faced by our students as they compose. She states,

> As teachers, we must realize that for those engaged in learning to write in a second language, the complexity of mastering writing skills is compounded both by the difficulties inherent in learning a second language and by the way in which first language literacy skills may transfer to or detract from the acquisition of second language skills (p. 2).

Learning to write in a foreign language is difficult simply because learning a foreign language is difficult. Sometimes L2 writers will be positively affected by their experience of already having learned a language, and sometimes their native language will interfere with their grasp of second language composition intricacies. Kroll (1990) also feels that L2 writing instructors should be knowledgeable of both native and L2

writing theoretical issues: "What teachers need is an understanding of all facets of this complex field of writing, and then to filter that understanding through a prism that can reflect how the factor of using a nonnative code affects second language performance" (p. 2).

It is the researcher's opinion that the complexity of the writing process is directly related to our reasons for teaching writing in the classroom. Scott (1996) states in her introduction to *Rethinking Foreign Language Writing*, "Current thinking holds that writing is a central part of the learning process and that there is a relationship between writing and cognitive development" (p. xi). Therefore, writing instruction is important not only as a means for developing overall language competency, but for facilitating general thinking skills as well.

The difficulty in assessing L2 writing

A second aspect found in L2 writing literature, which has implications for the role of writing in FL instruction, is a protracted discussion of the difficulty of L2 writing assessment. Due to the myriad of factors involved, evaluating writing is truly a complex task. While Carlson and Bridgeman (1986) focus on the ESL writer in discussing the complexity of writing assessment, their comments are equally valuable within the foreign language writing context: "Until we can design writing assessment tools with more confidence, all individuals who apply writing measures to decisions regarding ESL students should be cognizant of the numerous variables that condition the interpretation of their results" (p. 149). This lack of confidence is closely related to questions of reliability and validity, although according to at least one researcher, Hamp-Lyons (1990,

p. 70), "many issues remained unresolved, and most of these are validity issues," (including face validity, content validity, criterion validity and construct validity). Rather than addressing the "numerous variables" suggested by Carlson and Bridgeman (1986), (to include "task factors, administrative factors, and psychometric and interpretation factors" (pp. 139-146), I will limit my discussion to the various types of validity in terms of their relationship to writing assessment, and the advantages and disadvantages associated with the holistic scoring method.

Face validity is based on whether or not test items look valid to students and to the public. As with the other skills, tests of written competency should reflect course objectives. Content validity, according to Alderson, Clapman and Wall (1995, p. 173), is "the representativeness or sampling adequacy of the content of a measuring instrument; it involves 'experts' making judgments in some systematic way." Instructors or evaluators should ask themselves several questions concerning content validity of their writing assessment instrument: (1) Does it test what has been taught?, (2) Are students being asked to write using similar procedures to those used in class?, (3) Are the writing prompts clear?, and (4) Is there adequate sampling of writing skills, or does the instrument focus on only one aspect of writing competency? Criterion validity, again according to Alderson et al. (1995, p. 173), refers to "comparing students' test scores with measures of their ability gleaned from outside the test." Essay scores, for example, might be compared with scores from discrete-point tests designed to assess writing proficiency. Finally, construct validity is the correlation of test scores with the measure of actual behavior or ability believed to be tested. It refers to what the scores from our

writing assessment instruments actually mean. Does an 'A' on an essay, for example, refer to superior writing proficiency, or to some global assessment in relation to other students in the same class?

Clearly, the aforementioned issues of validity will have a significant impact on numerous aspects of the writing assessment process. One of the most dominant aspects discussed in writing assessment literature is the choice of scoring method. Before selecting a scoring method, however, Davis (1994, p. 153) suggests, "A major question that teachers must ask when grading written compositions is: Am I assessing content, quantity, writing ability, or all of the above?" Cohen (1994, p. 307) offers an even longer list of the possible factors to assess in writing, including "rhetorical structure, organization, register, style, economy, accuracy of meaning, appropriateness of language conventions, reader's understanding, and reader's acceptance." After deciding on exactly which aspect(s) is(are) being assessed, evaluators must then choose a scoring method, such as holistic, primary trait, multi-trait or analytic, or an alternative assessment method, such as portfolio evaluation. The remainder of this section will be focused on holistic assessment.

Holistic scoring entails assigning a single grade to a written product, and according to Hamp-Lyons (1990, p. 79), "is based on the view that there are inherent qualities of written text which are greater than the sum of the text's countable elements." It has the advantage of (1) tending to the compositions as a whole, thereby lessening the potential for damage by a single aspect of writing, and (2) focusing on the positive aspects of a text rather than its deficiencies (Cohen, 1994, p. 315). Carlson and Bridgeman (1986, p. 144)

caution, however, that "Holistic evaluations may be influenced by a number of characteristics of an essay, including content, organization, sentence structure, and mechanics." In other words, evaluators may be unduly influenced by a particular aspect of a composition, and grade the text accordingly. Often times in an attempt to improve reliability of holistic scoring, more than one evaluator will assign a grade, and then average the scores for a given text. Hamp-Lyons (1990, p. 79) points out that, "The rationale given for multiple scoring is that multiple judgments lead to a final score that is closer to a 'true score' than any single judgment," and yet she adds that these averages often mask any "true score." Perhaps the biggest disadvantage of traditional holistic scoring is its tendency to view a composition as a single final product.

Whether instructors choose to use traditional methods of assessment, such as holistic, primary trait, multi-trait or analytic, or alternative methods of assessment, such as portfolio evaluation, they are adding one more piece of the puzzle in determining students' overall second language proficiency. Assessment of any one skill does not provide the entire picture, and therefore writing instruction and writing assessment is essential in nearly all foreign language programs.

Interaction theory

As mentioned in Chapter 1, much of the support for communicative tasks and teaching methods in the classroom today comes from discourse interaction theory. Krashen's (1985) notion of "simplification" and "fine-tuning" of input led to numerous collaborative discourse studies, focusing on a variety of variables involved in both native speaker/non-native speaker (NS/NNS), and non-native/non-native speaker (NNS/NNS)

interactions. Three pertinent examples of interaction studies include Pica, Holliday, Lewis, Berducci and Newman (1991), who attempted to explain the role of gender in such interactions, Varonis & Gass (1985), who focused on NNS-NNS interactions, and Doughty & Pica (1986), who studied differences in interaction between teacher-to-student and student-to-student decision-making exercises. These three studies will be described in detail below.

Participants in the Pica et al. (1991) study included: (1) 17 male and 15 female Japanese L1 speakers learning English (NNSs), and (2) 12 male and 20 female native speakers (NSs) of American English. Information Gap, Jig-saw, and Opinion Exchange tasks were used to elicit data for this study. The Information Gap tasks were of the type that either the NS or the NNS was asked to describe an original picture while their partner drew a picture according to the given instructions. In the Jig-saw tasks, the NS-NNS dyads were asked to "reproduce an unseen sequence of pictures by exchanging their own uniquely held portions of the sequence" (Pica et al., 1991, p. 352). In the Opinion Exchange tasks, the participants were asked to exchange their personal opinions on the previous two activities. According to the authors (Pica et al., 1991, p. 351-352):

> These tasks provided a context for predicting and observing how learners could gain opportunities to (a) obtain and make use of their interlocutors' help in understanding unfamiliar input needed for interlanguage development and (b) respond to their interlocutors' requests for greater clarity and comprehensibility of their interlanguage output...

The researchers' hypotheses led to the following three predictions:

(a) cross-gender pairings, compared to same-gender pairings, would provide greater opportunities for NNSs to hear modified L2 input and to modify their own production;

(b) female NNS subjects, as more frequent signal producers than males, would be given more opportunities to hear modified L2 input; and

(c) male NNS subjects, as more frequent signal receivers than females, would receive and act on more opportunities to modify their interlanguage output (Pica et al., 1991, p. 354).

Results of the study, however, did not show gender as a "discriminating factor in the frequency of negotiated interaction and its associated opportunities for the comprehension of input, feedback on production, and modification of output" (Pica et al., 1991, p. 366). The researchers advocated further investigation into not only the specific role of gender in such interactions, but the more basic question of the precise role interaction plays in the learning of foreign languages. However, due to the difficulty for most second language teachers to establish NS/NNS dyads for conversational practice in the classroom, "it becomes essential to know whether two (or more) non-native speakers working together during group work can perform the same kind of negotiation for meaning" (Long & Porter, 1985, p. 215).

Varonis & Gass (1985) addressed this very question of the effectiveness of non-native speaker interactions in a study comparing interactions in non-native dyads versus those involving one native speaker. Fourteen conversational dyads between non-native speakers were the focus of the study, while dyads involving only native speakers or a mix of native and non-native speakers were used as controls. Participants in the study were not familiar with one another. They were all native speakers of Spanish or Japanese. In the non-native speaker dyads, males were paired with males, and females with females. The task given to the participants was simply to speak English with one another. They were encouraged to "introduce themselves and to find out about each other" (Varonis &

Gass, 1985, p. 72). Data analysis was performed on the first five minutes of each conversation "for the purpose of looking at the instances of non-understandings which occurred in the discourse" (ibid., p. 72). The researchers annotated instances of misunderstanding, including "triggers" (suggestions by one speaker that something was not understood), and responses to those triggers (such as repetition, expansion, rephrasing or acknowledgement).

In discussing their findings, Varonis & Gass (1985, p. 83) note that "NNS-NNS pairs not only spend more time negotiating than the other pairs, but also that their non-understandings involve more work in the resolution ..." It is precisely this type of "work" that is thought to lead to greater second language acquisition. Based on their study, Varonis & Gass (1985, p. 87) conclude that benefits for participants of NNS-NNS interactions include "(1) allowing them a non-threatening forum within which to practise developing language skills, and (2) providing them with an opportunity to receive input which they have made comprehensible through negotiation."

Taking a slightly different investigative approach on the issue of modified interactions, Doughty & Pica (1986) studied differences in interaction between teacher-to-student and student-to-student decision-making exercises. The researchers wanted to determine if tasks that require an exchange of information (as opposed to optional exchange tasks) would result in increased conversational modifications in the form of confirmation checks and clarification checks. They were also interested in building on their previous study (Pica & Doughty, 1985), and examining differences not only between teacher-fronted and small-group activities, but also student dyad performances.

Participants in the study were adult students (from various L1 backgrounds) and teachers from six intermediate ESL classes, who were native speakers of English with several years of teaching experience. Students for the small-group and dyad tasks were chosen at random by the teachers. Each activity was videotaped (as in the previous study) without the presence of the researcher, so as to minimize disruption of the situations observed.

The multi-way information task used consisted of a felt board held by each participant with one portion of a "master plan garden" that needed to be "planted." Participants were required to gather information and place loose felt flowers on their boards accordingly, without showing their portion of the master plan. Ten-minute segments of these activities were videotaped and analyzed for interactional modifications in each of the three participant configurations, that is teacher-fronted, small-group and student dyads.

Teacher demonstrations of the activity, as well as question and answer periods, were conducted prior to the taped segments in order to minimize students' confusion over the procedures of the task at hand. The researchers therefore assumed that any modifications recorded would concern task information and not procedural details.

As mentioned above, the researchers were interested in the amount of modifications used in optional versus required information exchange tasks, and also the possible differences when the task was held constant but the configurations of the participants changed, i.e. teacher-fronted v. small-group v. student dyads. In addition to simple calculation of the number of modifications used in each setting, ANOVA tests were used to determine significance of one variable over another.

In analyzing their data, the researchers discovered that students would interact more, and modify their interaction more if required information gap activities were used in the classroom. Doughty and Pica (1986, p. 321) assert that, "While a required information exchange task will compel students to talk more in either a teacher-fronted or a group situation, this increase in total production will result in an increase of modified interaction only when students are working in groups." When exchange of information is required by all participants in order to complete a task, they add, "a great deal of modification can be generated in a nonnative-speaker group situation" (Doughty & Pica, 1986, p. 322).

Although students produce a great number of ungrammatical utterances, results from this study lend support to the argument that small-group and pair-work activities provide tremendous opportunities for students to "produce the target language and to modify interaction." (ibid., p. 322). If one believes that modified interaction promotes second language acquisition, the benefits of tasks such as the ones used in this research are substantial.

Although these studies have made contributions toward understanding interactional modifications, of course there are limitations. Zuengler (1993) questions whether or not the same results would be found in spontaneous speech, as opposed to researcher-imposed tasks. Pica et al. (1991) point out that their study was conducted with "the basic assumption that languages are learned through interactions, but it is this very assumption that itself must first be tested" (p. 370). Perhaps Ellis' (1994) conclusion is the most enlightening: "In all likelihood, input combines with other factors such as the learner's

L1, the learner's communicative need to express certain meanings and the learner's internal processing mechanisms" (p. 288).

Although the great majority of interaction studies have focused on spoken production, it seems that results such as those reported in this section are also directly applicable to the productive skill of writing. Scarcella & Oxford (1992, p. 46) asserted:

> Although the research on input, interaction, and output focuses on oral communication almost exclusively, the findings also have implications for reading and writing. Simply put, when students' efforts to read and write are supported through the assistance of a more knowledgeable other, literacy skills develop.

In the present study, interaction will play a key role in the computer-mediated discussions. It will add to previous research in that it specifically addresses the productive skill of writing in the computer-based environment. If the results reported in this section hold true for the written, computer-based environment, it stands to reason that learning results from the tasks involving interaction should be distinguishable from those that do not.

Computer use and L2 writing

Research into the effectiveness of the computer in second language writing instruction has gone through several trends, which mirror the development and prevalence of various computer applications. The first research efforts focused on the effectiveness of feedback for grammatical exercises, as they were considered essential for the development of second language writing proficiency. The focus shifted as foreign language writing instructors followed the lead of native language (L1) writing instructors to use the computer for word-processing. Rapidly developing computer capabilities led to a third shift: focusing on the possible benefits to writing competency by using the computer for

e-mail messages. Finally, the most recent trend in computer-assisted writing research is concentrated on the advantages and disadvantages of computer conferencing, or computer-mediated communication (CMC), in the foreign language classroom. In order to present an overview of available research, I will briefly discuss a sampling of studies related to feedback, word processing, and the use of e-mail for second language writing instruction, but will focus the majority of my discussion on CMC research.

Computerized feedback

While research continues on the various methods of providing feedback to traditionally written compositions, research on feedback related to computer-assisted writing is still in the early stages of development. One such study, which analyses feedback on sentence-level correction during computerized grammatical exercises, demonstrates this clearly. Brandl (1995) conducted a study in which he investigated learner preferences for error feedback on computerized grammar exercises. The researcher was interested in determining whether the level of achievement of students (high v. low) and the difficulty of the task would influence students' preferences for feedback. The types of feedback considered were: (1) right or wrong message, (2) error location, (3) grammatical explanation of correct response, and (4) correct answer. The participants in the study were 21 third-semester German students, who used a computer-based program to study the passive voice. The methods of data collection used were an on-line tracking program, which listed the options chosen by each student, and follow-up interviews in order to assess the reasoning process students used in selecting the various feedback options.

Significant findings were that all students, regardless of their level of achievement, preferred the right/wrong message option to the other feedback options. Difficulty of task did not influence the students' selection of a feedback option. Another important finding was the fact that high-achievement students were less likely to look up correct answers than low-achievement students. High-achievement students seemed more interested in correcting the answers themselves, rather than taking the "easy way out" and being supplied with the correct answer.

This study demonstrates the ability of computers to track students' behaviors during grammatical exercises. The researcher harnessed this ability in order to provide insight into student preferences for computer feedback options. Many language teachers have the impression that low-achievement students are more likely to look up correct answers at the back of their workbooks, rather than figuring out the answers for themselves. This study shows that this behavior is being replicated in the computer lab.

Robinson (1989) also addressed the issue of feedback in a computerized setting. Her study, involving 83 junior high school, second semester of second-year Spanish students, "investigated a variety of factors related to 'meaningfulness' in order to compare their effects on language achievement in contrast with other factors related to 'form'" (Robinson, 1989, pp. 119-120). The error feedback treatments investigated were: (1) student discovery strategies (correct answer only, correct answer with explanation, error correction by blanking out letters, and error location with hints related to meaning), (2) implicit versus explicit correction, (3) student-controlled versus program-controlled help, and (4) recycling of missed items.

There were three significant findings regarding computerized feedback. Students showed greater achievement when the discovery strategy of 'error location with hints related to meaning' was used. In terms of student-controlled versus program-controlled help, the option that benefited the students the most was the combined program and student-controlled help. This option allowed the student to decide if help was necessary, and then the program would automatically supply the necessary information. Last, implicit feedback led to greater achievement than explicit correction.

Word processing

In her introduction of a recent text, titled "The Power of CALL," Pennington (1996, p. 8) states, "Word processing, with or without enhancements ... is an environment which creates a 'natural partnership' between the capabilities of the machine and the needs of the non-native writer, thereby helping the learner to develop a natural and effective writing process." Availability of resources, however, does not automatically lead students to more effective writing strategies as demonstrated by the following two studies.

Scott and New (1994) investigated foreign language students' writing process in a third-semester university French class. A computer writing program in French, called *Système-D*, was used to track the writing process of these students as they wrote their compositions. The computer logged pertinent information, such as the time spent on the essay, the number of times the dictionary, grammar or verb indexes were used, and the number of times a request was made to see a word or phrase used in context. Twenty-one students participated in the study, and four compositions and their revisions were used for

the purpose of the analysis. The purpose of this research project was two-fold: to see how these particular students went about writing their compositions, and to develop an evaluation instrument for future use with this program to teach French.

The researchers noted several writing strategies used by the students which were either effective or ineffective in foreign language writing. Strategies such as recursive writing, example inquiry, conjugation inquiry, and French dictionary inquiries were considered effective strategies. English dictionary inquiries and limited time on task were considered ineffective strategies. A total of ten effective strategies and three negative strategies were compiled as part of the evaluation instrument developed in this study. The researchers found that by making students aware of their strategies (through explanation of the computer log returned with each composition), students were able to improve their use of more effective strategies over the course of the study. For example, the researchers noted a positive change in dictionary use: "Many students began to rely on their intuition and look up words in French rather than immediately going to English, and general dictionary use declined significantly for all students" (Scott & New, 1994, p. 14). This led the researchers to the belief that "students could be explicitly taught to develop more strategies for foreign language writing" (p. 17). They noted the systematic method of inquiry into the writing process in French offered by this computer program, and urged continued research into the foreign language writing process through the use of such computer logs.

It seems that, left to their own devices, students may not take advantage of the numerous capabilities available through word processing programs, and may even adopt

strategies which are counterproductive to the writing process. Smith (1990) found this to be true in her study involving the comparison of three groups: (1) a computer-conferencing group, (2) a word processing group, and (3) a traditional pen-and-paper group, used as a control. There were 118 fourth-semester Spanish students at the university level participating in the study. Reading, conversation, listening, written ideas, written accuracy, and overall progress were assessed for each group. According to the researcher (Smith, 1990, p. 78), "Production (for the computer-conferencing group) tended toward creative self-expression and lively debates that paralleled and supplemented in-class conversations." The word processing group admitted, "they focused more on accuracy than on creative expression of ideas" (p. 78). Rather than taking risks and focusing on global or concept development, Smith (1990, p. 78) notes "they limited their structural choices to those with which they felt the most secure and devoted a significant portion of their time to searching for and correcting grammar and vocabulary errors" (p. 78). This would be considered a definite disadvantage of word processing programs if left uncorrected.

In comparing results from the two computer-based writing groups, Smith (1990, p. 81) claims that "Student production patterns suggest that a combination of activities stressing the conversational writing of the computer conference and the accuracy focus of the word processor are necessary to promote development in both form and function."

The use of e-mail

E-mail has been used in the second language writing classroom as a means of communication between instructors and students, between members of an individual

class, and between students from different institutions. The use of e-mail for writing instruction differs significantly from the first two computer applications mentioned (feedback and word processing) in that writing is no longer an isolated, individualized activity. Students become actively engaged with the writing process and are forced to think of their audiences because they are expecting replies from either their instructor, fellow students, or even native-speaker pen-pals. This unique instructional method offers benefits to students such as social interaction and authentic communication, and increased feedback opportunities for instructors as evidenced by the following studies.

In discussing appropriate pedagogy for networked L1 English composition classes, Eldred (1991) points out the benefits of e-mailing messages to bulletin boards, which could easily be applied to the foreign language learning context: "The responses ... seemed to join them as a class, to increase their sense of identity as part of a group, and to reinforce the idea that they could hold an opinion about the novel that differed from mine" (p. 51). Bulletin boards, therefore, offer the students a forum for their discussions in which equitable participation is encouraged. They are no longer writing solely for their instructor. By sending messages to be posted and by reading input from fellow classmates, students seem to bond together as a group and feel supported by their peers in the writing process.

Barson, Frommer & Swartz (1993) achieved similar results in a 5-year long project involving Harvard, Stanford University, and University of Pittsburgh in which intermediate French classes participated in e-mail exchanges in order to co-construct end-of-semester newspapers or magazines. Rather than unstructured "chit-chat" exchanges,

the authors proposed "a model based on goal-driven human activity, both individual and in groups, arising from a desire to communicate ideas, share perceptions, and, in most cases, cooperate in the development of a common end-product" (Barson et al., 1993, p. 567). The authors contend that this type of communication (as opposed to "standard language practice routines") closely resembles real-world communication. In addition, the students in this study were largely responsible for numerous decisions concerning their end-of-semester project, which in turn meant that they were at least partially responsible for the development of the course syllabus.

The primary methods of data collection for the study were "self-reported student questionnaires, observation of student performance in class, and analysis of messages sent back and forth between collaborating universities and among students at each home campus" (Barson et al., 1993, p. 581). Only one segment of the study was analyzed empirically (See Herrmann, 1990) for details. Unfortunately, this quantitative approach did not produce significant results.

> The evaluation procedures, using the CEEB French Listening and Reading Test and the ACTFL oral proficiency interview at the beginning and end of the project (a six-week period) did not produce significant quantitative results, but pointed out the extreme difficulty of quantifying a communication event so replete with variables, interpersonal factors, and varying student background and learning styles (Barson et al., 1993, p. 581)

There were, however, several distinct benefits discovered over the course of the 5-year study. Because the classes involved in this study were more learner-centered, the authors point out that the teacher's role is obviously redefined for this setting. Rather than being the all-knowing being who imparts knowledge to the students, the instructor "plays a supportive, coaching role acknowledging the value of student initiative ..." (Barson et al.,

1993, p. 569). This is similar to the role an instructor would play in a computer-mediated classroom. While the instructor may initiate discussion in the form of questions based on a reading, or topics offered for discussion, the students then play a tremendous part in shaping and controlling the "conversation."

Reduced anxiety, and the opportunity to engage in conversational French were also noted as clear advantages of this type of communication. While e-mail messaging cannot be equated with traditional conversation, there seems to be considerable overlap, as noted by the authors:

> In fact, e-mail discourse, as most users will acknowledge, is situated somewhere between spoken and written language. For language learners it offers the possibility of using language casually, having the time to formulate conversational rejoinders before expressing them, writing spontaneous, often elliptic messages, much as one would speak (Barson et al., 1993, p. 571).

Finally, due to the relaxed atmosphere generated by this computer medium, the authors noted increased target language use throughout the study. They stated:

> During all of the (…) collaborations, students participated actively using the target language almost exclusively for electronic communication on a continuing basis, exchanging views and/or writing articles or making films, as they explored their interests with students at the other institution for an entire term (ibid., p. 580)

Clearly, camaraderie developed among the students while they were fully engaged in their task-based electronic communication.

Esling (1991) describes similar bonding among students who participated in an e-mail exchange project between the University of Victoria, and the University of British Columbia. A total of 20 ESL students (10 at each institution) at the intermediate university level participated in this descriptive study. Rather than trying to establish proficiency development differences due to computer-based learning as opposed to

traditional classroom learning, Esling chose to make "general observations of the types of L2 discourse generated during the networking task, and their discourse function" (Esling, 1991, p. 125). One finding of particular interest to my study was that "Through the displaying of similarities and the revealing of additional information about self, participants develop an 'affiliation' that helps the network participants accomplish 'intimacy'" (ibid., p. 126). Because the students were not familiar with one another, it is only natural that they started with introductions and a brief exchange of personal information about themselves. In the second language setting, this "information gap" activity provides the opportunity for authentic communication, considered essential for developing writing proficiency.

However, just as we saw in the case of word processing, opportunity afforded by the computer medium does not automatically result in expected benefits. In her descriptive articles concerning the management of technology-based learning in the classroom, Eldred (1991) stresses that pedagogical applications must be put in place in order for computer-assisted activities, such as networking, to be most effective. Appropriate training, in the form of one-day workshops for instructors and "hands-on" experience for both instructors and students, should smooth the transition to a technology-based language learning environment. Eldred (1991, pp. 5-55) also makes several recommendations to ensure full participation of students within the electronic medium:

(1) Use the system as much as possible.
(2) Require all students to participate, even if this means giving them grades for doing so.
(3) Set minimum lengths for responses.
(4) Talk to students about the goal of classroom discussions and talk to them about disclaimers or "tags."

(5) Ask them to sign their responses.

Eldred (1991) feels that by following these simple suggestions, we will be more likely to achieve a recognized advantage of this medium: equitable participation among our students.

Instructors may also find advantages in using e-mail as a means of providing feedback to their students on their written work. While traditional pen-and-paper feedback methods are often considered time-consuming, and less than effective in improving students' writing proficiency, Hoffman (1996) contends that "e-mail feedback makes it possible for a teacher to develop ideas, ask more and better questions, give examples, and offer more positive remarks in the same amount of time formerly reserved for handwritten marking" (p. 67).

Computer-mediated communication

Language teachers across the country are making tremendous strides toward capitalizing on the unlimited potential offered by their computerized language labs. Where students were once constrained to individual interaction with a single computer, they can now search for target culture information worldwide, communicate with native speakers via the Internet, and participate in simultaneous "conversations" with their teacher and fellow students thanks to local area networks connecting their computers. In this section I will provide a detailed discussion of three studies that support claims of effectiveness for such computer-enhanced language learning. These studies are considered to be most germane to the present study.

Oliva & Pollastrini (1995) conducted a study designed to assess students' views of the integration of Internet sources into the Italian language curriculum at the University of Utah over the course of two years (1992-1994). Four major tools were incorporated into the classes: E-mail, Usenet News, Gopher and Internet Relay Chat. End-of-course critiques were used as the primary means of data collection. Students were asked to make self-assessments of their progress in the four major language skills (reading, writing, speaking and listening). The majority of subjects participating in the study (76 out of 88) were advanced learners of Italian, having spent 18 to 24 months in Italy as part of their mission work for the Church of Latter Day Saints. However, the authors noted, "Their skills in writing were generally less developed, and their vocabulary was colloquial rather than academic" (Oliva & Pollastrini, 1995, p. 553).

The findings included an overall perception by the students of increased writing proficiency (as opposed to the other three skills) due to the use of the Internet tools. Curiously enough, even though students were continually reading material on the computer screens, they did not feel that their reading skills had improved through the use of this technology. Students responded that e-mail was the most useful tool added to the curriculum. Negative aspects of the program noted included technical difficulties associated with the use of computers, a lack of experience with the Internet, and a lack of instructor feedback on written work produced by the students. Students also expressed concerns for greater class time devoted to speaking and less discussion time focused on the computer. On a more positive note, many students felt that their experiences in the computer lab were beneficial in terms of future employment opportunities.

While the design method used in this study was rather simple, it does show the growing interest in computer-mediated communication tools, including newsgroups and the Internet. The researchers could improve their design method through the use of proficiency exams in addition to the self-assessment surveys. This would increase reliability of enhanced proficiency claims made by the students.

In a second study conducted by Kern (1995), computer-mediated communication was studied in terms of its effect on language production. The stated goals of this study were as follows: "to compare features of second-semester French students' discussions via networked computers with features of their oral class discussions, and to assess students' and teachers' response to using networked computers in the foreign language classroom" (pp. 457-458). A local area network, Daedalus Interchange, was used to facilitate synchronous discussion among French students over the course of seven 50-minute sessions, which took place once every two weeks in lieu of regular classtime. At the start of each session, the instructor would post questions pertaining to an assigned reading, and students could voluntarily respond to the questions, submit questions of their own, or engage in the written "conversation" submitted by their classmates. The data collection for this study included written transcripts of the "conversations" produced in the computer lab, transcripts of the follow-up oral discussions which took place in the classroom, and questionnaire responses of both students ($N = 40$) and teachers ($N = 11$) collected at the end of the study.

Quantity of output was significantly higher for the computer sessions than for the oral classroom discussions. Every student participated in the computer lab discussions, as

opposed to a dominance by certain students in the oral discussions. "Student-talk" versus

"teacher-talk" was significantly higher in the computer sessions. The students were

much more engaged in "conversations" with their classmates than with their instructor.

Kern (1995, p. 470) states, "Direct student-to-student interaction stimulated students'

interest in one another, contributed to peer learning, and decreased students' reliance on

the instructor." Finally, students produced a greater variety of discourse functions

(notably questions) when participating in the computer discussions. Overall assessment

of the experience by the students was quite positive, whereas the instructors' response

was more neutral (possibly due to technical difficulties, and the diversions from the topic

at hand in the computer lab). While the author cautions against using this type of

technology as a replacement for classroom discussion, he recognizes the potential

benefits of networked computers, including the following:

(1) more frequent opportunity for students to express their ideas than in an oral discussion of equivalent duration,
(2) greater amount of language production,
(3) more time to develop and refine comments - possibly leading to greater precision and sophistication of expression,
(4) encouragement of a collaborative spirit among students,
(5) enhanced motivation for language practice and, in particular greater involvement of students who do not often participate in oral discussions,
(6) reduction of anxiety related to oral communication in a FL, and
(7) positive effects on students' writing ability, and perhaps on speaking ability as well (Kern, 1995, p. 461).

In a third study, Beauvois (1995) conducted an experiment in a similar fashion, using

E-Talk, computer-assisted classroom discussion, in the foreign language learning

environment. Over the course of four computer-assisted lab sessions, third-semester

university-level French students participated in "synchronous, real-time, electronic

discussions" (p. 179), based on previously assigned readings from their text. The author was interested in discovering students' attitudes toward learning in this type of environment, the relationships they developed through prolonged discussions, and the linguistic benefits (if any) derived from this exercise.

Attitudes gleaned from the questionnaires were overwhelmingly positive. Students cited the stress-free environment, the chance to write without worrying about immediate correction, and social benefits of network interaction (i.e. getting to know their classmates better) as positive aspects of their experience. The instructors were also quite pleased with the lab sessions due to the tremendous output from their students ("over 200 utterances per session" [Beauvois, 1995, p. 182]) and the near-exclusive use of the target language throughout the sessions. The shift from teacher-centered to student-centered learning is an additional positive outcome of the experiment. While further research is needed to assess specific linguistic benefits of this type of learning, the positive results obtained indicated that computer conferencing could very well enhance second language learning.

Clearly, we are in the infancy stages of research when it comes to computer-mediated communication, but early findings from studies such as the three outlined above show promise for the future. Positive attitudes on behalf of the students toward computer-related communication may result in increased motivation, which may in turn positively affect language proficiency. The comparison of quantity of output in the second and third studies reveals advantages for the computer sessions over typical classroom discussions. This increased use of the target language in computer-mediated

communication studies has been confirmed elsewhere by Chun (1994) and Kelm (1992). The "student-talk" versus "teacher-talk" ratio achieved during the computer sessions is something which has been found to be very different and less balanced in typical instructional settings. Increased student-talk is indicative of both student-centered learning and student empowerment, and has been cited in numerous studies focused on this type of communication, including Bump (1990), Chun (1994), and Leppanen and Kalaja (1995). Finally, the added benefit of increased interaction and socialization of students seemed to come naturally to participants in Kern's (1995) and Beauvois' (1995) studies. Leppanen and Kalaja (1995) caution, however, that "training is needed to make computer conferencing users realize that the system is a flexible means of exchanging ideas, arguing and commenting in written form, and consequently, of transforming writing into a social and interactive activity" (p. 35). Obviously, additional research is necessary to confirm or deny all of these findings in a variety of other instructional computer settings related to the teaching of foreign languages.

With the growing use of computers in foreign language classrooms, there is a tremendous need for continued research in the four areas reviewed in this section: computerized feedback, word processing, the use of e-mail, and computer-mediated communication. The studies cited represent small strides in the right direction, but they certainly do not present us with definitive answers concerning computer use and second language writing proficiency. Questions raised in one study need to be followed up in subsequent studies and/or replicated in a variety of instructional settings. Finally, teachers and researchers alike need to continually inform themselves of the ways

computer technology can enhance not only second language writing, but all aspects of foreign language learning, to include listening comprehension, reading and speaking proficiency.

Individual differences

Research has shown that individual differences play a tremendous role in language learning classrooms. Where students were once considered passive recipients of the knowledge imparted by the instructor, it is now widely recognized that students play an active role in their learning, and they all approach learning differently. Some of the possible sources of individual differences are gender, age, motivation, attitudes, and personality. This section will provide an overview of the applicable literature in three sub-sections: (1) age and gender, (2) motivation and attitudes, and (3) personality differences.

Age and gender

There is a considerable amount of debate in foreign language literature concerning the impact of age on language learning. According to Ellis (1994, p. 484), "One of the reasons for the lack of consensus on the age issue is undoubtedly the difficulty of comparing the results of studies that have employed very different methods." Some are focused on addressing the age issue for early starters over long periods of time, while others address learners of different ages and their level of achievement in various aspects of second language proficiency. Drawing conclusions from the vast number of the two types of studies, Larsen-Freeman & Long (1991, p. 155) write the following:

> As revealed by long-term studies, younger is better in the most crucial area, ultimate attainment, with only quite young (child) starters being able to achieve accent-free,

native-like performance in a SL. As revealed by short-term studies, older learners are at an advantage in rate of acquisition (adults faster than children, and older children faster than younger children).

This belief that "younger is better" is "supported by the critical period hypothesis, according to which there is a fixed span of years during which language learning can take place naturally and effortlessly, and after which it is not possible to be completely successful" (Ellis, 1994, p. 484).

In addition to this research on age, there have been a great number of studies on the issue of gender and foreign language learning. One subset of gender-related studies focuses on the differences males and females exhibit in the use of language learning strategies. Oxford, Nyikos and Ehrman (1988) summarized four studies conducted in this area, and concluded that, "In three of the four studies (the three studies in which strategy use was studied spontaneously, without any strategy training or intervention), frequency and variety of strategy use was significantly greater for women" (p. 326). Specifically, females showed a greater tendency toward "conversational or input elicitation strategies."

Gass & Varonis (1986) had similar findings in their study focused on the differences in native speaker – non-native speaker interactions. While other studies have addressed gender as a secondary question, this study "was conceived specifically to test for sex differences in NNS/NNS interactions between ESL learners of a single language background" (ibid., p. 328). Participants in the study were 20 university-level English learners, who were all native speakers of Japanese. Data collection consisted of "30 taped conversations of 10 NNS dyads: four male/female pairs, three male/male pairs, and three female/female pairs" (ibid., p. 328). Subjects were asked to engage in a free

conversation task (i.e. discussing a topic of interest without any researcher-imposed restrictions) and two picture tasks, in which one subject would describe a picture, while the other one attempted to draw it.

Curiously, results from all three tasks showed that "same-sex pairs exhibited much less negotiation than did mixed pairs" (ibid., p. 332). For example, males would initiate 'negotiations for meaning' more often when conversing with females, and less when they were paired with other males. Males would also maintain the conversations for a longer period of time when given the opportunity. Gass & Varonis (1986, p. 349) concluded that "Men took greater advantage of the opportunities to use the conversation in a way that allowed them to produce a greater amount of 'comprehensible output,' whereas women utilized the conversation to obtain a greater amount of 'comprehensible input.'

Research has also touched on the social orientation of men and women in an attempt to explain their differences in approach to foreign language acquisition. Tying in with their work on language learning strategies, Oxford et al. (1988, p. 324) suggest the differences in foreign language learning approaches mirror native language use strategies "reflecting the greater social orientation of women." Furthermore, "greater empathy, politeness, and concern for others is displayed in women's speech" (ibid, p. 324). Maltz & Borker (1982) also addressed this use of language for specific purposes. According to their observations, females use words, "(1) to create and maintain relationships of closeness and equality, (2) to criticize others in acceptable ways, and (3) to interpret accurately the speech of other girls" (ibid, p. 205). In contrast, males use speech "(1) to

assert their position of dominance, (2) to attract and maintain an audience, and (3) to assert themselves when others have the floor" (ibid, p. 207).

Results from all the studies on age and gender point to the need for continued investigation of their role in a variety of language learning contexts. Age would be of considerable importance when participants varied from very young learners to university-level subjects. Results from the gender-related studies cited above suggest that gender may be a salient variable in L2 acquisition studies, particularly in learning situations involving interaction. However, results are inconclusive. Some studies have shown differences of performance variables attributable to gender, while others have not (recall Pica et al., 1991, previously discussed in the Interaction Theory section).

Motivation and attitudes

Robert C. Gardner has conducted a great deal of research into students' attitudes and motivation. His extensive studies of English-speaking subjects learning French in Canada have led to the development of his socio-educational model of second language acquisition. Gardner feels that attitudes and motivation are paramount in determining how active a student will be in learning. As stated in Au (1988, p. 77), motivation in Gardner's model is "conceived as comprising three components, *effort* to achieve the goal, *desire* to achieve the goal and positive *affect* toward the goal." Gardner claims this motivation will therefore be affected by the learner's attitudes towards the native speakers (as a group), towards other foreign groups in general, and also by the learner's attitudes towards the actual study of the language. In this section, I will first discuss the primary data collection method used by Gardner to assess students' attitudes and

motivation. Next, several critiques of his model will be reviewed, including the validity question concerning the questionnaires, the direction of causation, and the question of whether or not there is indeed a relationship between attitudes and motivation on one hand, and second language proficiency on the other. Last, I will address the concept of motivation as it is applied to technology-based language learning.

In order to measure students' motivation and attitudes, Gardner's primary method of data collection is the questionnaire known as the Attitude and Motivation Test Battery (AMTB), as cited in Au (1988, p. 78). Interest in foreign languages, integrative motivation, attitudes toward learning French and motivational intensity are examples of aspects measured by the nine scales used to assess integrative motive on the AMTB. Subjects are asked to respond to positively and negatively worded statements, on a scale from "strongly agree" to "strongly disagree", in each of the nine areas. A composite score of the scales is used to describe students as possessing either *integrative* or *instrumental* motivation. Integrative motivation is categorized as a desire to associate with and become a part of the target language culture. Instrumental motivation is defined as a desire to learn the target language for practical purposes, such as increased job opportunities, or monetary incentives. Gardner's early research findings led to the belief that greater integrative motivation resulted in greater second language proficiency.

Gardner's systematic and empirically verifiable approach toward assessing student attitudes is well-documented (Gardner, 1980; Gardner, 1988a; Gardner, 1988b; Gardner, 1990). Nevertheless, critics have proposed several problems with the socio-educational model and its methods of data collection. First, there is a validity concern with respect to

the questionnaires. Critics have asked whether the questionnaire items actually measure the constructs they purport to measure. Ellis (1994, p. 511) comments on the "mismatch between the theoretical definition of motivation which Gardner provides and the operational constructs that he has investigated." Gardner is assuming that students with a higher level of motivation will work harder and achieve greater levels of second language proficiency. Although there are exceptions, this assumption has credibility. Furthermore, Ellis (1994, p. 511) states that the self-report questionnaires used "do not provide any indication of the actual effort which learners put into their learning." One must also consider the motivation of the subjects to answer one way or another. Because the intent of the questionnaire is obvious to the participants, a bias in one direction or another could mask actual attitudes or motivation. One must also consider the personal differences of subjects' interpretations of the 7-point scale.

Despite all of these critiques of the AMTB, Gardner's assessment of motivation and attitudes is valid due to the refinement of his questionnaire over the years, and the sheer number of subjects he has tested. Even Au (1988), who criticizes Gardner for using a composite score for the nine scales of the questionnaire, recognizes their reliability after widespread use. He states, "The scales have been administered to 5,000 English Canadian pupils, grades 7 to 11, in seven regions of Canada yielding high internal consistency estimates and moderate test-retest reliability estimates" (Au, 1988, p. 79).

A second area of concern with Gardner's model focuses on the direction of causation. Gardner's (1988b, p. 113) claim is that "second language proficiency is facilitated by characteristics of the integrative motive operating in conjunction with other factors, such

as effectiveness of the teachers, appropriate pedagogical techniques, relevant drills, opportunities for practice, a supportive environment and some learner characteristics." Opponents, such as Au (1988), have questioned whether or not achievement in the second language is what actually causes increased motivation and more positive attitudes toward the learning situation. Au cites a longitudinal study, spanning ten years, by Burnstall, Jamieson, Cohen, and Hargreaves (1974), in which 5,700 British students learning French were assessed as to attitudes/motivation and second language proficiency. According to Au (1988), results of this study indicated that "early achievement in French affected later attitudes toward learning French and later achievement in French to a significantly greater extent than early attitudes toward learning French affected the subsequent development of either attitudes or achievement" (p. 86). In Gardner's (1988b, p. 115) rebuttal, he does not discount the significance of the study cited by Au, but emphasizes that "only a few measures of attitudes" were used, and therefore it is "not necessarily comparable" with his own previous studies. He added, "The direction of causality is inferred by the investigator, and the best that can be said is that he or she should consider the various alternatives and attempt to conduct the research in such a way as to rule out other possibilities, if feasible" (Gardner, 1988b, p. 116). He does not deny the "two-way street" notion of achievement affecting motivation and attitudes, or vice versa. His restatement (1988b, p.114) of the hypothesized processes involving attitudes/motivation and second language proficiency is worthy of long citation:

> ... sets of attitudinal variables (integrativeness and attitudes toward the learning situation) provide a foundation for an individual's motivation to learn a second

language, and such motivation orients him or her to seek out opportunities to learn and practice the language (in both formal and informal contexts). This experience will have both linguistic and nonlinguistic outcomes that will in turn have attitudinal and motivational implications. It thus proposes that this is a dynamic process and that there will be an association between attitudinal/motivational attributes and proficiency in the second language.

Gardner chose to conduct his research of this "dynamic process" in terms of attitudes and motivation affecting second language proficiency, but judging from his comments, he would not be opposed to the investigation of second language achievement on learners' attitudes and motivation. In the end, Gardner discounts arguments over the direction of causation as being unproductive.

Finally, there is a concern expressed in the literature about whether or not there is indeed a relationship between attitudes and motivation on one hand, and second language proficiency on the other. In reaction to studies that report no significant relation between attitudes/motivation and second language proficiency, Gardner (1988a) claims the relationships are there, you just need to find them! He feels that studies which fail to find a relationship fall into one of three categories: "(1) those in which the attitudes, motivation, and/or proficiency variables are not measured adequately, either in terms of reliability or validity, (2) those in which a homogeneous sample is used with respect to attitudes and/or motivation, or to proficiency, or to both, and (3) those which use small sample sizes or too few items to assess a variable" (Gardner, 1988a, p. 138). Gardner confirms the need to control for these variables to accurately assess student motivation and attitudes.

Based on the studies conducted by Gardner and his fellow researchers, as well as some of the critiques, the strengths of his model are easily identifiable. Cook (1993) praises

Gardner's theory and research for his scientific approach in attempting to explain the role of motivation in his model. Cook considers it an empirically verifiable model based on actual evidence. He also feels Gardner's model lays the basis for more in-depth research. Gardner (1988b, p. 102) himself wrote, "the model was never intended to be one that would explain all, or even most, of the variance in second-language learning because this would ignore the complexity of individuals as well as the language-learning task." Gardner readily admits to narrowing the scope of second language acquisition, and makes no claim to have all the answers for this intricate learning process. Nevertheless, his model provides the ideal starting point for continued research in the field of learners' attitudes and motivation and second language acquisition.

A recent trend in motivation literature has been a call for an expanded view of the motivation construct -- one which emphasizes the unique characteristics of language learning in the classroom (Dornyei, 1994; Oxford & Shearin, 1994; Crookes and Schmidt, 1991). Undoubtedly, the research on motivation will continue to expand as it is addressed within the realm of technology-based language learning. How does this unique context reopen questions for the study of motivation? What are some of the research findings discussed in recent literature concerning motivation and computer-based language learning? In response to these questions, the remainder of this section will focus on research based on computer-assisted second language writing, as it is most germane to the present study.

Computer-assisted language learning, particularly the use of e-mail and conferencing, offers several advantages that could lead to enhanced student motivation. Although

research in this area is in its infancy, numerous recurring themes which have emerged over the past seven years include (1) student control/empowerment, (2) less authoritative role of the instructor, (3) increased target language use, (4) reduced anxiety, (5) more equitable participation, (6) authenticity of tasks, (7) increased confidence, and (8) increased socialization and interaction. Several of these advantages have been discussed previously in the computer-mediated communication section. Discussion here will be limited to the first four aspects listed.

Student empowerment and control has been cited in at least three studies as a possible key to greater student motivation in language learning (Barson, Frommer & Swartz, 1993; Bump, 1990; Beauvois, 1995). In the Barson et al. (1993) study, (described in detail in the E-mail section above) students were largely responsible for numerous decisions concerning their end-of-semester project, which in turn meant that they were at least partially responsible for the development of the course syllabus. It stands to reason that students who are involved in the decision-making process, and who take responsibility for their own learning are typically more motivated than those who are not afforded the opportunity to do so.

Closely linked with the notion of greater student control is the reduced authority of the foreign language instructor. In a study of synchronous communication via computer networks, Kelm (1992, p. 444) submits that his comments "constituted only 8% of the total number of messages sent, and this percentage includes the introductory statements and topic suggestions." In the Barson et al. (1993) study cited above, the authors point out that the teacher's role is obviously redefined for the task-oriented, e-mail

communication setting. Rather than being the all-knowing being who imparts knowledge to the students, the instructor "plays a supportive, coaching role acknowledging the value of student initiative ..." (Barson et al., 1993, p. 569). Similarly, in a study focused on computer-mediated discussions, Beauvois (1995, p. 184) notes, "The lack of teacher-driven discussion resulted in an automatic decentralization of the lab environment." Although some instructors might consider this aspect of computer-assisted learning to be a drawback, one might also consider it to be a definite advantage. Foreign language instructors must remember that "reduced authority" does not imply a total lack of control. The role of the instructor has simply shifted, allowing for greater student responsibility and individual learning to take place.

A third aspect of computer-related learning that may enhance student motivation is the increased use of the target language. Advocates of the proficiency movement and the communicative method have often called for increased use of the target language as a means towards development of greater second language competency. The computer-assisted learning context seems to be the perfect environment for such language production. In the Beauvois (1995) study, cited above, the instructors involved were quite pleased with the lab sessions due to the tremendous output from their students ("over 200 utterances per session" [p. 182]) and the near exclusive use of the target language throughout the sessions. Even if English is sometimes used to explain technical difficulties, Barson et al. (1993) found that "students eventually acquire a substantial lexicon of correct foreign language technical terms, develop the ability to explain their problems coherently, and more importantly, become familiar with talking about what

they are doing, helping each other when difficulties occur with no particular self-consciousness about using the target language" (p. 572). If increased target language use indeed leads to greater second language proficiency, which in turn leads to greater motivation, clearly the computer-assisted learning environment has a great deal to offer foreign language students.

A final recurring theme that is found in computer-assisted language learning literature is that of reduced anxiety provided by the computer medium. The e-mail sessions of the Barson et al. (1993) study resulted in a "congenial atmosphere" (p. 582), which "stimulated (students) to communicate more spontaneously and naturally while engaged in task-oriented learning" (p. 581). Bump (1990) also noted the reduced anxiety and greater freedom of expression exhibited by students in a graduate humanities computing class. Although his study focused on discussion groups in English literature classes, one student's comment seemed equally appropriate to the foreign language learning environment: "I was more apt to express my feelings using the computer than I was in group or face-to-face discussion" (p. 54). The collaborative nature of computer-mediated discussions offers the same advantage, as evidenced by the findings of Beauvois' (1995) study; students cited the stress-free environment, the opportunity to write without worrying about immediate correction, and the social benefits of network interaction as positive aspects of their experience.

While the majority of research studies emphasize positive results concerning the motivational level of students in technology-based language learning settings, it is important to remember that not *all* students are positively affected when working with

computers. For example, in her study focused on computer-mediated communication, Meunier (1997) found that, "Initially, 33% of the students were nervous about using a computer in the foreign language writing class ..., and 15% felt that going to a computer laboratory would be intimidating ..." (p. 15). This initial anxiety could certainly inhibit a student's motivation to blossom to its fullest potential. Luckily, in Meunier's (1997) study, it seemed to diminish, as students became accustomed to writing in the computer-based environment. Perhaps as students are exposed to computer-related teaching techniques on a greater scale, not only in foreign language classes, but in other classes as well, there will be even fewer reports of negatively affected students at the outset of studies.

The question of motivation is obviously far from being resolved in either the traditional classroom setting or in the technology-based learning environment. While Gardner has laid a firm foundation for the study of motivation, as described earlier, researchers must take the initiative to continually expand the theoretical construct of motivation (much as Dornyei, 1994, Oxford and Shearin, 1994, and Crookes and Schmidt, 1991, have done) in order for it to explain the unique characteristics of classroom and computer language learning situations. Likert-type questionnaires, open-ended questions and personal interviews have all proven effective in previous studies, and will most likely continue to be used in future motivational studies. Using these assessment instruments in the computer-related environment will likely lead to a greater understanding of aspects which could enhance foreign language motivation, such as

student control, the changing role of the instructor, increased target language output, and reduced anxiety, as well as other motivational factors yet to be identified.

Personality differences

In addition to the previously mentioned individual differences, personality factors have been investigated in numerous second language research studies. While there is general agreement among researchers that personality factors play a role in second language acquisition success, Brown (1994, p. 135) points out the difficulties of defining personality traits for the purposes of empirical research: "Abstract concepts such as empathy, aggression, extroversion, and other common terms are difficult to define operationally. Standardized psychological tests often form an empirical definition of such concepts, but constant revisions are evidence of an ongoing struggle for validity." This section will provide a detailed review of four studies addressing personality differences and the impact they have on language learning, and two studies that specifically address personality differences and computer-based language learning. First, however, is a description of the personality test most often used in these type of studies: the Myers-Briggs Type Indicator (MBTI) self-scorable personality test (Form G) (Myers & Myers, 1987a, 1987b).

The MBTI consists of 94 forced multiple-choice questions, allowing the choice of one response out of two for each question. Based on their responses, students receive scores on four psychological traits: (1) extraversion or introversion, (2) sensing or intuition, (3) thinking or feeling, and (4) judgment or perception. Definitions of these personality preferences are as follows:

Extraversion (E): students who are focused on, energized by, and direct their energy toward the outer world

Introversion (I): students who are focused on and energized by their own inner world, thoughts and feelings, and inner experiences

Sensing (S): awareness of what is real, how things look, sound, feel, etc., what is actually going on, reality of the situation, focus on immediate practical matters

Intuition (I): awareness of meanings and relationships beyond the obvious, focus on big picture and essential patterns, possibilities for the future

Thinking (T): decisions based on objective analysis and logical sequences, weigh evidence in a detached manner

Feeling (F): decisions based on what is important to people, subjective, person-centered values

Judging (J): structure and organize, decide and make conclusions and then move on, get things settled

Perceiving (P): want to adapt to the outer world, keep options open to whatever comes along (Tiberio & Hammer, 1993).

In describing the MBTI, Ehrman (1996, p. 107) points out,

> This version provides consistency scores for each of the preference scales; these consistency scores are interpreted as strength of preference. That is, a higher 'preference (consistency) score' is inferred to mean greater expressed preference for that pole of the scale (not necessarily possession of more of the qualities associated with that pole of the scale).

Therefore, subjects' responses are not taken as evidence of being at strictly one pole or the other for each of the personality scales, but rather as evidence of a natural tendency to favor one pole over the other. These psychological traits have been shown to have an effect on language learning, as evidenced by the following studies.

After the University of Hawaii at Manoa instituted a one-year foreign language requirement for all undergraduates, Moody (1988) conducted a study to determine differences of personality types among foreign language learners versus students in other academic disciplines (e.g. business, education, engineering, nursing, social work and tropical agriculture). 561 students participated in the study, the majority of whom (497) were completing their foreign language requirement. While comparisons with other

academic disciplines are not particularly useful for my study, Moody's discussion of his

findings is noteworthy. Results from the study lend support to the idea that teachers must

provide a variety of activities in the language classroom. Moody (1988, p. 399) writes,

> Not every kind of drill appeals to everyone. Spending very much time on one activity
> will lose some students. Instead, teachers will earn the students' attention,
> participation, and success by providing a somewhat unpredictable set of ways of
> performing, with frequent changes, stopping well short of the point where students are
> turned off or bored.

Variety of activity, therefore, is essential not only for traditional language learning

classroom activities, but also for those within the computer medium.

Similar findings, particularly for extraverted and intuitive students, are found in

Ehrman & Oxford's (1990) qualitative study of 20 Foreign Service Institute (FSI)

students. The researchers state that "Extraverts need variety and social stimulation both

in and out of class. They need to be active, at least verbally; it is even better if they can

be active physically" (Ehrman & Oxford, 1990, p. 318). In discussing preferences of

sensing students, the authors add, "Intuitives need change and variety. Thus, language

training for Intuitives needs to permit global, even self-directed learning and induction,

but through subtle guidance that does not leave students feeling abandoned" (ibid., p.

320).

Ehrman & Oxford (1995) also made use of the MBTI in a study involving 855

subjects, the majority of whom were experienced language learners. The primary method

of data collection was a questionnaire. According to the authors, "Students were asked to

complete a biographical data form and between one and seven instruments examining

aptitude, learning strategies and learning styles, based on a random sampling procedure"

(ibid., p. 71). Assessments from these instruments were correlated with end-of-training proficiency scores.

Results from the MBTI showed that the majority of subjects were "slightly introverted, fairly intuitive and thinking-oriented and quite clearly judging" (ibid., p. 75). When correlated with end-of-training proficiency scores, some scales proved significant, while others did not. For this unique group of subjects, Ehrman & Oxford asserted that "The most important scale on the MBTI-TDI with respect to proficiency ratings was sensing-intuition. This is consistent with theory: Sensing-intuition is the scale that directly assesses how people like to take in information, i.e. to learn" (ibid., p. 80). Meanwhile, the extraversion-introversion, thinking-feeling, and judging-perceiving scales did not show significant correlation with proficiency measures. The researchers cautioned that "The personality variables may have shown low correlations with end-of-training proficiency due to the lack of variation of students" (Ehrman & Oxford, 1995, p. 82). The subjects in this study (all FSI students) were a "highly selective and self-selected group" (ibid., p. 83).

Finally, in a descriptive study, Jensen & DiTiberio (1984) focused on personality differences and their impact on English composition. This study is unique in that it is the only study to my knowledge that focused specifically on personality differences (as determined by the MBTI) and the writing of compositions. The authors made use of the MBTI as part of writing workshops at both the University of Illinois at Chicago and Georgia State University in order to help students understand how personality type might effect writing processes.

From their interactions with extraverts and introverts, Jensen & DiTiberio made the following observations: "Extraverts often find freewriting a good method for developing ideas, for they think better when writing quickly, impulsively, and uncritically" (Jensen & DiTiberio (1984, p. 289). Introverts, on the other hand, "generally have less difficulty with writing than extraverts, perhaps because they tend to follow the composing process as it is traditionally taught. Their basic writing process often follows the pre-writing-writing-rewriting pattern" (ibid, p. 289). This seems to imply that extraverts would have an advantage in a computer-mediated writing environment, whereas introverts would prefer take-home writing assignments in order to allow for numerous revisions.

The computer-mediated environment might also benefit feeling types (as opposed to thinking types) according to observations from Jensen & DiTiberio (1984). The authors pointed out that what is most important for feeling types is "to connect with another human being through their communication" (Jensen & DiTiberio, 1984, p. 293). Thinking types, on the other hand, "tend to be particularly motivated when an assignment engages their mind analytically and is presented with a clear and logical rationale ..." (ibid., p. 293).

These types of personality issues were investigated in two separate studies focused on computer-mediated communication. Meunier (1997) investigated personality and motivational factors in computer-mediated foreign language classrooms. Specific research questions of her study were the following:

(1) What motivational and affective factors are associated with networking participation?
(2) What motivational and affective differences are there between students of various personalities?

(3) What are the motivational and affective effects of different teaching styles? (Meunier, 1997, p. 11).

Sixty-four advanced university-level French and German students, and 5 instructors participated in the study. Subjects were all enrolled in foreign language writing classes that had regularly scheduled classes in a computer-based language learning center. The two primary methods of data collection were an end-of-course questionnaire and the Myers-Briggs Type Indicator (MBTI) self-scorable personality test (Myers & Myers, 1987).

Among other significant findings concerning personality traits and participation in computer-mediated discussions, two are particularly germane to the present study:

(1) Introverts and Extraverts are equally stimulated by on-line discussions, which confirms previous studies that CMC has an equalizing effect on participation and that personalities can be transcended on-line.
(2) A larger percentage of Thinkers than Feelers favor CMFLC (Computer-mediated Foreign Language Communication). Indeed, Thinkers experiment more with their writing than Feelers while on-line because they appreciate the fact that they can elaborate well-constructed responses without interruption. Feelers miss seeing facial expression and body language, which leads them to perceive on-line discussions as somewhat impersonal (Meunier, 1997, pp. 28-29).

Meunier's (1997) study is noteworthy in that it addresses both students' attitudes and personality variables in a computer-mediated environment. It is complemented by the following study that addressed these issues using a more quantitative approach.

Ittzes (1997) investigated the effects of personality differences on writing performance in two separate contexts: (1) computer conferences and (2) traditional pen-and-paper group journals. Participants in the study were 46 intermediate, university-level German students. Quantitative analysis on the written samples produced in the two contexts included assessment of a variety of variables, such as lexical diversity, lexical density,

errors of morphology, lexical errors, and mechanical errors. Interestingly, Ittzes found significant effects of personality on three of these variables. Students who were more extraverted than introverted committed a greater number of morphological errors. Extraverts were also more likely to make mechanical errors. For both cases, Ittzes (1997, pp. 129-130) surmises that a focus on content rather than form may be characteristic of extraverted students. Finally, personality had an effect of the number of lexical errors produced. The extraversion/introversion personality factor was a significant predictor of "variation in the number of lexical errors produced: extraverted learners (…) were more likely to make more lexical errors than introverted learners" (ibid., p. 129).

In summary, studies cited in this section confirm the importance of addressing personality variables in any language learning context. Clearly, individual differences in personality can have significant effects on tasks that favor one personality type over another. In computer-based activities, for example, introverted students may thrive on one-on-one interaction with the computer, while extraverted students prefer live interactions with their peers. The present study will add to previous research by addressing the personality variable in the context of two very different computer-based pre-writing activities: (1) collaborative, computer-mediated communication, and (2) non-collaborative writing skills practice.

Chapter summary

This chapter provided an overview of background literature that was considered germane to the present study. Literature on L2 writing theory has shown that we continue to struggle to understand the foreign language writing process, and have yet to

develop a comprehensive theory of L2 writing. Nevertheless, researchers agree on the complexity of the L2 writing process, and advocate writing instruction for developing overall language proficiency, as well as general thinking skills. Interaction studies have focused on different types of interaction (e.g. student-teacher, student-student, NNS-NNS, etc.), and have shown the benefits of interaction on oral production. Research suggests that these results might also apply to the productive skill of writing. In the realm of computer-based writing, there is a great need for continued research in the areas of computerized feedback, word processing, use of e-mail, and computer-mediated communication (CMC). Benefits cited from CMC studies became the driving force behind the present investigation. Finally, individual differences, including age, gender, motivation/attitudes, and personality differences, have played a significant role in both traditional, classroom-based studies, and in computer-mediated contexts. Previous research suggests that continued investigation of writing, interaction, computer use, and individual differences is essential. The present study attempts to expand previous research by addressing each of these issues in a comprehensive, computer-based, language learning environment.

Chapter 3
METHODOLOGY

Introduction

This study will compare the quantity and quality of writing produced by L2 students after participating in either collaborative, computer-mediated communication, or non-collaborative, computer-assisted writing skills practice. Chapter 2 presented a review of the research relevant to this study. This chapter will begin with a summary of the research questions and hypotheses developed for this study. (These questions were first articulated in Chapter 1. They appear here for the sake of review and for accessibility to the reader.) Next, it will explain the research design, to include research site and subjects, data collection methods and instruments. Last, it will detail data analysis procedures, including holistic evaluations of the compositions, computer text analysis software and statistical tests used to answer the research questions.

Research questions

In order to investigate the effects of two different contexts, (1) networked computer communication and (2) computer-based writing skills practice, on second language writing among French foreign language learners, the following research questions will be investigated. Hypotheses are listed where appropriate.

(1) What are the effects of collaborative computer-mediated discussion and non-collaborative computer-assisted writing skills practice on L2 writing?

"Effects" will be described in terms of six variables: (a) total number of words, (b) grammatical accuracy, (c) lexical density, (d) lexical diversity, (e) syntactic complexity, and (f) overall writing quality. These variables will be described in detail in the data analysis section.

H_o: There will be no significant differences in the compositions produced after collaborative computer-mediated discussion and non-collaborative computer-assisted writing skills practice.

(2) How do individual learner differences (including age, gender, major, and GPA) relate to quantity and quality of performance in the two contexts?

(3) How do personality factors relate to quantity and quality of performance in the two contexts?

(4) How does language proficiency relate to quantity and quality of performance in the two contexts?

(5) What are students' attitudes toward the two pre-writing activities used in this study: (a) collaborative computer-mediated discussion and (b) non-collaborative computer-assisted writing skills practice?

An additional research question having to do with a meta-analysis of the research tools used in the study will also be addressed:

(6) What are the advantages and disadvantages of using computer text analysis programs in assessing L2 texts?

Research site and subjects

The United States Air Force Academy (USAFA) was chosen as the research site for this study for several reasons. First, the researcher's previous teaching experience at USAFA, as well as her active duty status in the Air Force allowed her to have access to the students, former colleagues, and technological resources that the Academy has to offer.

Second, the Academy is interested in continued language learning research that is directly applicable to its unique population of students. The USAFA web site (http://www.usafa.af.mil) describes the curriculum for its students, known as cadets, in the following way:

> Cadets complete four years of studies leading to a Bachelor of Science degree. Emphasis is given to academics, military training, athletic conditioning, and spiritual and ethical development. Academics includes classes in the basic sciences, engineering, the humanities and the social sciences. Within this framework, all cadets complete a core curriculum consisting of 91.5 semester hours. They can specialize in any of 25 academic majors.

Cadets are typically 18 to 21 years old, and may be considered a heterogeneous population in that they represent all 50 states, and a cross-section of various socio-economic backgrounds.

Last, this site was chosen because of its tremendous computer resources, used extensively for foreign language instruction. First-year language students in French, German and Spanish spend 50% of class time working in the interactive videodisc environment. Unfortunately, upper-division foreign language classes do not spend nearly as much time in contact with authentic materials in the interactive computer environment.

Having been an instructor for three years at this institution, the researcher hopes to explore the potential of even greater computer use among the intermediate and advanced student populations, particularly in terms of writing proficiency development.

The study itself took place in the Networked Classroom (NCL) of the Air Force Academy, due to its ability to provide the interactive computer-mediated environment needed for this research. (For a layout of the NCL, see Figures 1 and 2.)

Figure 1. – Layout view of the Networked Classroom
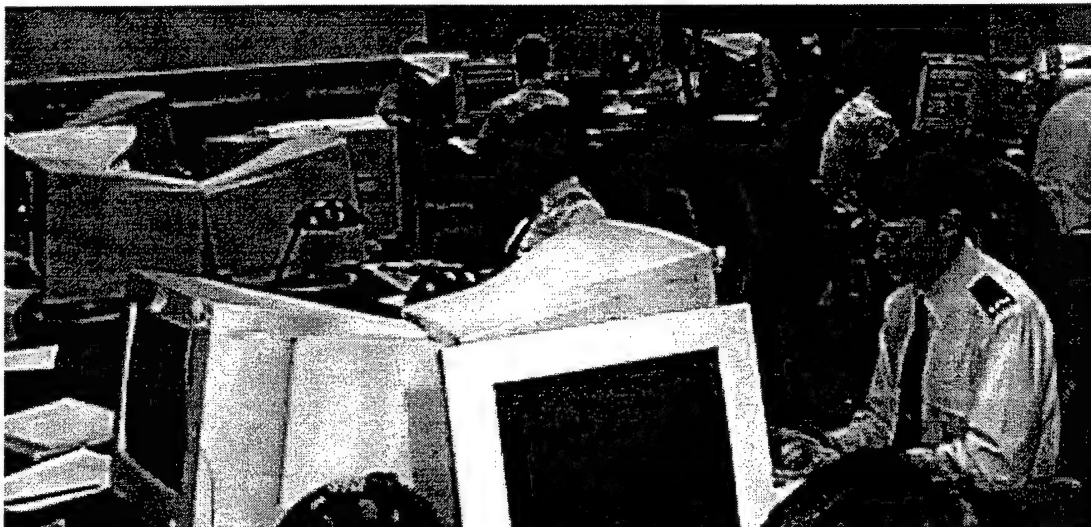
Figure 2. – A second layout view of the Networked Classroom
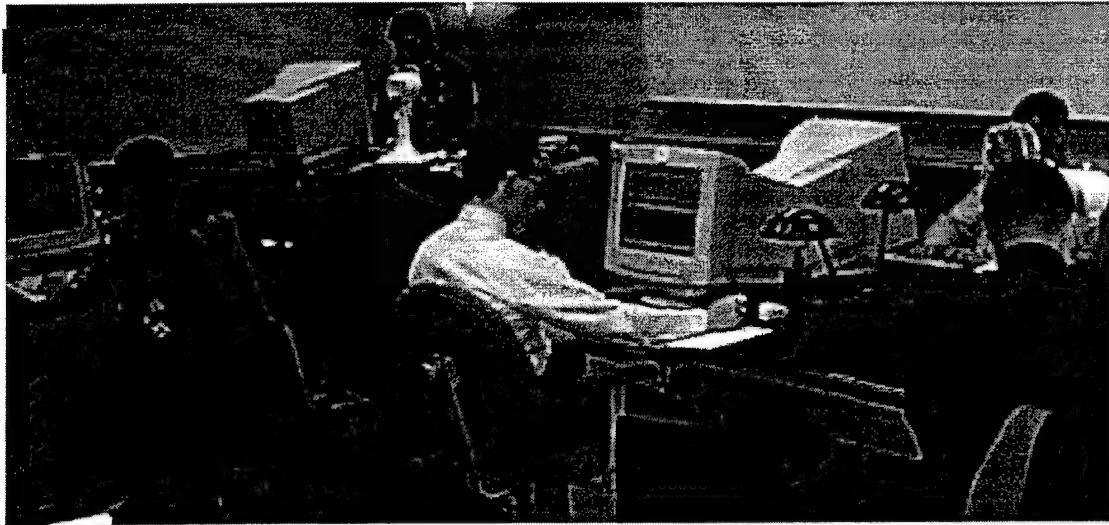
The NCL, along with an adjoining classroom, is equipped with 22 Pentium 166 MHz

computers. All computers in the lab are networked. The lab is used for classes across all

academic disciplines, and is open for individual student use if not previously scheduled

for class. The computers were perfectly adequate for the networking and word-

processing tasks performed in this study.

The subjects for this study were 42 intermediate/advanced French students enrolled in

French classes at USAFA. Students were enrolled in either French 223 (Intermediate

French III) or French 321 (Advanced French). These courses are described on the

USAFA Foreign Language Department's web site (http://www.usafa.af.mil/dff) as

follows:

French 223: Focus on conversational practice and oral comprehension of
contemporary spoken language with increased attention to reading and writing.
Course is designed to more fully develop the four basic language skills.
French 321: A capstone skills development course designed to enhance the student's

ability to register a base proficiency on Department of Defense proficiency examinations. Intensive practice in speaking, listening and reading.

Although writing is not specifically addressed in the 321 course description, a review of the course syllabus, as well as a discussion with the French 321 course director revealed that writing was an integral part of the curriculum.

The study began with 44 students. Two students were dropped from the study due to their absence from the practice session. (The practice session will be explained in detail in the next section.) One of these students did not know what to do when she attended the first day of data collection in the computer lab, and asked for the researcher's assistance. It was clear that she would be disadvantaged when compared with those who had attended the practice session. The second student came to the lab, read the directions and caught on quickly to the assignment given without any assistance. However, in order to maintain similar data collection conditions, he was dropped from the study as well.

Research design

Subjects involved in this study were divided into two groups to participate in either (1) collaborative, computer-mediated communication (CMC), or (2) non-collaborative, computer-assisted writing skills practice as a precursor to writing compositions. Because of scheduling constraints, the two French classes that participated in this study did not meet in the Networked Classroom at the same time. However, within each individual class, subjects were randomly divided into two groups to participate in one of the pre-writing activities for each phase of the data collection. Subjects then wrote compositions independently. These compositions were compared to determine the effects of the two

different pre-writing contexts on the writing phase. This section will first explain the overall design of the study, and will then describe in detail each of the data collection procedures.

The overall design of this study was primarily descriptive. According to McDonough & McDonough (1997, p. 45), "Descriptive research … aims at making explicit the significant effects within the context itself." This study took a "snap-shot" look at two different pre-writing activities and then compared students' compositions following each of these activities. The study incorporated a cross-over design, so that the group originally assigned to do writing skills practice within each class participated in computer-mediated communication (CMC) for the second half of the study, while the other group did CMC for the first half, and writing skills practice for the second. A cross-over design enabled all subjects to participate in both treatments of the project, CMC as well as computer-assisted writing skills. It also facilitated an analysis of quantity and quality of writing produced in two separate contexts. The study also employed an intact group; that is, students were already assigned to one of the two classes participating in the study. As noted by Hatch & Lazaraton (1991, p. 86), "While such designs will not allow us to make *causal* (cause-effect) statements about the findings, they will allow us to *give evidence in support of* links between variables for these particular classes." It is clear that this study would benefit from this type of design in order to answer the research questions outlined at the beginning of this chapter.

The next sections will describe the software programs and procedures used for the writing skills and CMC groups.

Système-D

The writing skills group participated in non-collaborative writing skills practice. In other words, students in this group were seated at their own computer terminals, and only had access to a writing skills program presented on the computer screen. The writing skills program used in this study was the Windows Version 2.1 of *Système-D: Writing Assistant for French* (Noblitt & Pet, 1993). According to the Teacher's Guide (Scott & Terry, 1992) for this software, "*Système-D* provides a rich learning environment in which students can explore the writing process from an early stage in their study of French. It is a unique writing tool that lends itself to a systematic developmental writing program; there are resources for students at the elementary, intermediate and more advanced levels of French study" (Terry & Scott, 1992, p. 1).

Previous research has shown that *Système-D* is an invaluable tool for studying issues related to foreign language writing. Scott & New (1994), for example, investigated foreign language students' writing process in a third-semester university French class. *Système-D* was used to track the writing process of these students as they wrote their compositions. The computer logged pertinent information, such as the time spent on the essay, the number of times the dictionary, grammar or verb indexes were used, and the number of times a request was made to see a word or phrase used in context.

A review of the computer logs revealed "recurring patterns" of writing strategies used by the students in foreign language writing (Scott & New, 1994, p. 11). Scott & New asserted that strategies such as recursive writing, example inquiry, conjugation inquiry, and French dictionary inquiries were effective strategies used during the writing process. English dictionary inquiries and limited time on task were considered ineffective strategies. The researchers found that by making students aware of their strategies (through explanation of the computer log returned with each composition), students were able to improve their use of more effective strategies over the course of the study. Although "tracking" or data collection by the *Système-D* software was not used for the purposes of the present study, the program itself was being used as a viable alternative to interactive writing practice.

While using *Système-D*, students were instructed to work at their own pace, and to choose from a variety of writing skills exercises, including vocabulary building, grammatical review, and format review. They were told to use this writing software primarily as a research tool, searching for vocabulary, grammatical points, and phrases which would assist them in writing their compositions during the following class session. To assist them with their search of material, students were given an instruction sheet, detailing the tasks they would be expected to complete as part of their compositions, as well as appropriate grammar, vocabulary or phrases found in *Système-D* under each task (See Appendix A for a sample of the instructions [given for session #1]). Students had 45 minutes to work with the writing skills program. They were told to take whatever notes

they wished during the writing skills exercises for subsequent use during the follow-on composition phase. In order to take their notes in an orderly fashion, students were given a note sheet with numbers corresponding to the numbered tasks on the instruction sheet (See Appendix B). For example, in response to Task #2 for the first *Système-D* session, "Describe your family members," students would list relevant vocabulary or possessive adjectives found in *Système-D* under Note #2 on the note sheet. These notes were collected at the end of the pre-writing session, and given back to the students at the start of the composition phase. The composition phase took place during the students' next scheduled class (i.e., 2 days later).

Computer-mediated communication (CMC)

Rather than the one-on-one interaction with the computer indicative of the *Système-D* treatment, the computer-mediated communication (CMC) treatment focused on collaboration or cooperation via the computer. In discussing second language learning strategies, O'Malley & Chamot (1990, p. 229) define cooperation as, "Working together with one or more peers to solve a problem, pool information, check a learning task, model a language activity, or get feedback on oral or written performance." Subjects in this study were asked to collaborate via an electronic synchronous discussion, or "chat" mode. Hoffman (1996, pp. 63-64) defines these terms as follows:

> Synchronous communication, similar to computer bulletin **Chat Mode**, enables learners to participate in real-time discussion. Communication software commonly uses split screens to allow each participant in a chat session to compose messages while viewing other messages that are posted to the list in the order in which they were sent (emphasis in original).

Research studies on this type of computer-mediated communication have found numerous advantages for foreign language instruction, including student control and empowerment (Barson, Frommer & Swartz, 1993; Beauvois, 1995; Bump, 1990; Chun, 1994; Kern, 1995; Leppanen & Kalaja, 1995), increased target language use (Barson et al., 1993; Beauvois, 1995; Kelm, 1992; Kern, 1995, Kroonenberg 1994/1995), more equitable participation (Beauvois, 1995; Bump, 1990; Eldred, 1991; Kern, 1995), increased socialization and interaction (Beauvois, 1995; Kroonenberg, 1994/1995), reduced anxiety (Barson et al., 1993; Beauvois, 1995; Bump, 1990; Kelm, 1992; Kern, 1995; Smith, 1990), and increased confidence (Beauvois, 1995; Kelm, 1992; Kroonenberg, 1994/1995). (For a detailed discussion of these studies, see the Computer-mediated Communication section in Chapter 2).

The CMC group was arranged in clusters of three or four students each. The computers in each cluster were linked via a local area network and the software chosen to facilitate interactive written "discussion" was Microsoft Internet Explorer 4.0's Netmeeting. The researcher and three assistants "established" the netmeeting before the start of each pre-writing session. Three computers were designated as the "hosts" for the meeting, and two or three other computers were designated to "join" the hosts for a meeting. The computers in any one cluster were physically separated, so students in a meeting did not have direct visual or audio contact with other members of their groups. The figure below shows the three host computers and the computers linked to each host.

Figure 3
Host and linked computers

Key
Host #2 ———
Host # 20 —— · ——
Host #25 ··········
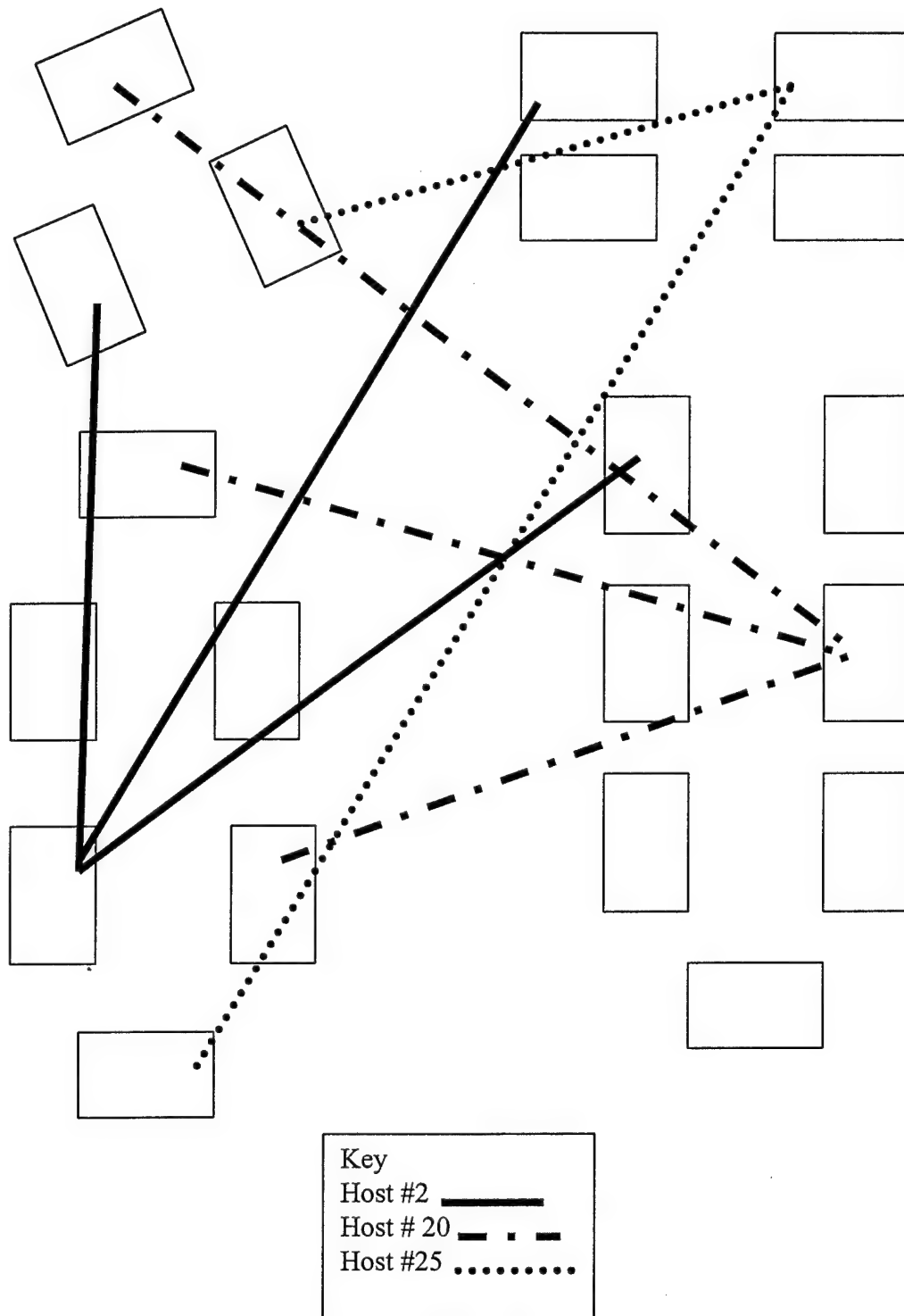
Once the Netmeeting was established, the researcher and the assistants selected the

"Chat" mode for the students' written discussion.

> Netmeeting Chat enables all meeting participants to exchange typed messages, which
> is helpful when more than two people attend a meeting. As soon as one person in the
> meeting starts Chat, it appears on everyone's screens. Each participant can then type
> messages to send to the others. Every message appears in the Chat window, identified
> by the sender's name along with the date and time ... (Johnson, Geller & Kirk, 1997).

In order to start the chat session in an anonymous fashion, the "sender's name" generated

along with each message sent, was a computer name and number, i.e. "dfelab 13."

Although the computer did not automatically produce names with each entry, students

would often ask within the first few lines of the script for other group members to

identify themselves. (The first pre-writing session lent itself to this practice because

subjects were discussing a letter of introduction, however it happened in the second

session as well when the topic did not require self-identification.) Students composed

their input in the bottom portion of the screen (marked "Message"), while a scrolling text

of all messages sent by the students in one group would appear in the larger block on top

(See sample chat window in Figure 4.)

Figure 4. Sample Chat window


```
Untitled - Chat - Not in call                              [_][□][X]
File  Edit  View  Options  Help

  2/10/98 10:37:28 AM "dfelab 16", "Ou est vos 'hometown"
  2/10/98 10:37:46 AM "dfelab 6", "en Tennessee"
  2/10/98 10:38:02 AM "dfelab 2", "Mon 'hometown' est San Diego"
  2/10/98 10:38:21 AM "dfelab 16", "Oh la la, le Tennessee! Mon petit ami
  attends l'ecole en Tennessee, a Vanderbuilt"




  Message:   Quel est le mot pour "hometown"

  Send to:   Everyone In Chat
  Chat messages
```

The top portion of the message screen displays messages in a scrolling fashion already

sent by members of this particular netmeeting. In the lower portion of the screen, in the

box marked "Message," one subject is composing a message to be sent to the others in

the group. He wrote, "Quel est le mot pour 'hometown." ("What is the word for

'hometown.') When this student hits the "send" key, this message will appear in the

scrolling message portion of the screen (along with the sender's computer identification,

the date and the time) on each of the computers of the students participating in the

discussion.

Students in the CMC group were instructed to interact with the other members in their

group about the information provided on their instruction sheet (See Appendix C for a

sample of the CMC instructions [given for task #2]). The "Suggestions for discussion" were identical to the tasks they would be expected to perform during the composition phase of the study. As students composed and sent messages to the group, they were immediately available for review by the other three group members. The original design for the study had the CMC group taking notes during their interactive discussion for subsequent use during the follow-on composition phase. This was changed following the observation in the practice session that it was impractical for the students to interrupt their written discussions to take notes. Therefore, students were told that they would receive hard copies of their "scripts" produced by their group at the start of the following class session. The composition phase took place during the students' next scheduled class (i.e., 2 days later).

All written transactions were saved on the hard drives of the "host" computers, as well as on floppy disks. The researcher printed hard copies of the scripts produced by each student cluster, and presented copies to each student before the start of the composition class session.

Practice session

Before the start of the actual study, students spent a full class session (50 minutes) familiarizing themselves with the features of the laboratory, CMC and the writing skills program, *Système-D*. After briefly explaining the purpose of the research study, the researcher passed out instructions for the practice session that were identical in format to those developed for the actual data collection days (See appendices D and E). The

instructions for both the CMC and *Système-D* groups were read aloud, and students were given the opportunity to ask clarification questions before starting the computer activities. Subjects were told that *Système-D* would be used primarily as a resource tool to look up material under the "Reference" section (i.e., Phrases, Grammar, and Vocabulary.) They were instructed not to draft portions of their composition during the pre-writing phase, but rather to use their time to gather information pertinent to their compositions. Students in the CMC group were told that they would be collaborating/interacting with their peers in a type of "chat" session. They were instructed to do this in French, and to use the discussion questions provided as a guide for their "written discussion." The CMC group was given an "accent guide" (See Appendix F) to facilitate placing accents appropriately in their computer texts. (Many of the students were familiar with the "alt" key plus a numeric code provided by the researcher.) Both groups of students were given note sheets (See Appendix B), and were told to take as many notes as they wished. Although the practice session was not followed by a composition task, students were told to take the notes as practice for what they would be expected to do during the actual pre-writing sessions. After 25 minutes, students switched groups in order to familiarize themselves with both pre-writing activities. The researcher and a lab technician were available for the entire session to answer any student questions.

All students appeared comfortable and proficient working with *Système-D* and CMC after the practice session. In addition to checking the "Reference" section for phrases, grammar and vocabulary while working with *Système-D*, students used both the English

to French, and French to English dictionary key. During the CMC portions of the practice session, the researcher noticed that students would make eye contact, giggle at each other after certain entries, and even whisper with their neighbors on occasion. They were able to do this because students in each cluster were in close proximity to one another. This arrangement was changed for the actual data collection sessions (See description under CMC above).

Minor technical difficulties were addressed and eliminated during the course of the practice session. Due to the students' enthusiasm for working with both CMC and *Système-D* during the practice session, they were advised not to practice using either activity outside of class for the duration of the study.

Compositions

Following each pre-writing session, students met in the networked classroom during their next regularly scheduled class session (two days later) to write their compositions. The theme for each composition was identical to the theme used for its corresponding pre-writing session. (Before the start of the study, the researcher and the course instructors chose two themes which were considered appropriate for the course levels of the participating students, i.e., French 223 and French 321. The two themes were (1) a letter of introduction to a French-speaking pen-pal, and (2) a text describing hometown details for a travel brochure for foreigners. Students were considered equally prepared to discuss both themes.) Students were given instruction sheets that gave the topic of the composition, as well as a list of required information to address (See Appendix G for

instructions for composition #1 and composition #2). Both treatment groups received

identical instructions for each composition task. In addition to the instructions, students

were also given their notes if they used *Système-D* during the pre-writing session, or the

scripts of the "written conversations" if they participated in CMC during the pre-writing

session. Other than the notes or the scripts, students were not allowed to use outside

resources, such as dictionaries or textbooks, during the writing phase. The researcher as

well as lab technicians were available to answer students' technical computer-related

questions during the composition phase. After directions for the composition were read

aloud by the researcher, students had 45 minutes to complete their written assignment.

Students were told that their compositions would be collected and used for research

purposes. They were asked to produce the very best composition of which they were

capable during the time allotted. All students used Microsoft Word 97 for the

composition phase of the study. Compositions were saved on the hard drives of each

computer, as well as on floppy disks.

For an overview of the methodology, please see Table 1.

Table 1. General overview of methodology

METHODOLOGY	
WRITING SKILLS (SYSTEME-D) GROUP	**COMPUTER-MEDIATED COMMUNICATION (CMC) GROUP**
Non-collaborative, student-computer interaction	Student clusters of 3 or 4 linked computers - focus on collaboration
45 minutes of writing skills practice (*Système-D* activities)	45 mins of computer-mediated "discussion"
45 min timed essay - written independently, 2 days after the pre-writing phase	45 min timed essay - written independently, 2 days after the pre-writing phase

Background questionnaire

Starting with the background questionnaire developed by Ittzes (1997), the researcher

modified it by adding questions pertaining to background information for the participants

in this study. The questionnaire consisted of 7 questions: 4 short-answer questions

related to prior French experience, current French use outside of class, and experience

with computer conferencing; 3 multiple choice questions addressing the number of years

spent learning French, as well as prior experience with word processing and e-mail

messages (See Appendix H). Students were given the questionnaire to complete as

homework after the practice session. All questionnaires were returned during the

following class session (i.e., 2 days later). Because students at the Air Force Academy

must adhere to strict standards of the Cadet Honor Code, or risk the possibility of

dismissal, information obtained from these self-reported background questionnaires will

be considered reliable.

In addition to the background questionnaire, the researcher obtained demographic information (including gender, class year, cumulative (Cum) GPA, major, minor, and age) from the Air Force Academy's computerized student data information system, known as "Q2." This information is considered reliable because the database is updated and maintained by the Academy's registrar office. A summary of the demographic information obtained from this computer database is given in Table 2.

Table 2. Demographic information of subjects

Gender distribution	29 males, 13 females
Class year distribution	20 freshmen, 17 sophomores, 5 juniors
Average Cum GPA	3.0
Distribution of Majors	23 undeclared, 6 Foreign Area Studies, 4 Engineering, 2 History, 1 Operation Research, 1 Math, 1 Meteorology, 1 Political Science, 1 Chemistry, 1 Management, 1 English
Number of French minors	7
Average age	20.1 (range: 19-22)

Individual learner differences, including those listed above, have been shown to have an effect on second language performance (Brown, 1994; Larsen-Freeman & Long, 1991; O'Malley & Chamot, 1993). They were collected as part of this study in an attempt to identify those characteristics that may relate to performance outcome variables, as specified in research question #2.

Due to the large number of undeclared majors (over 50% of the subjects) and the limited range of ages of subjects, these two variables were dropped from consideration during statistical analyses.

Myers-Briggs Type Indicator (MBTI)

In order to measure personality factors, students completed the Myers-Briggs Type Indicator (MBTI) self-scorable personality test (Form G) (Myers & Myers, 1987a, 1987b). Students were given the MBTI to complete as homework after the practice session. They had two days to complete the questionnaire before the following class session. All questionnaires were completed in a timely manner. Students received scores on four psychological traits: (1) extraversion or introversion, (2) sensing or intuition, (3) thinking or feeling, and (4) judgment or perception. Definitions of these personality preferences are discussed at length in Chapter 2 (see Personality Differences section).

These psychological traits have been shown to have an effect on language learning. Ehrman (1996) explained personality preferences with respect to general language learning based on numerous case studies. Additional research involving personality preferences has been conducted in both experimental and descriptive studies within the computer-related language learning environment (Meunier, 1997; Ittzes, 1997). (The issue of the MBTI was discussed in detail in Chapter 2.) Clearly, personality preferences could have an effect on subjects' performance in this study. The MBTI is being used here to identify those characteristics that may relate to writing performance following participation in two very different pre-writing activities. Based on the results from studies focused on writing and personality differences (reviewed in Chapter 2) and the need to reduce the number of independent variables (due to a small sample size), only

two scales of the MBTI will be used for statistical analyses: (1) Extraversion/Introversion scale and (2) Thinking/Feeling scale.

A summary of the number and percentages of students belonging to each of the personality types of the MBTI is provided in Table 3.

Table 3. MBTI Results

Extraverts: 25 (59.5%)	Introverts: 17 (40.5%)
Sensing: 14 (33.3%)	Intuition: 28 (66.7%)
Thinking: 27 (64.3%)	Feeling: 15 (35.7%)
Judging: 20 (47.6%)	Perceiving: 22 (52.4%)

Note that there are a slightly larger percentage of extraverts (59.5%) than introverts (40.5%) involved in the study. Also noteworthy is the large discrepancy between Thinkers (64.3%) and Feelers (35.7%). Given the student population of military cadets, all of whom are pursuing scientific degrees, the larger percentage of Thinkers is not surprising. Finally, there are twice as many intuitive students (28) as there are sensing students (14).

University of Wisconsin placement exam

Students completed the University of Wisconsin foreign language placement exam (Form 901) four days prior to the data collection phase of this study. This test is routinely given to "approximately 500 to 1000 students per year" at the University of Wisconsin for the purpose of placement into their foreign language courses (A. S. Cohen,

personal communication, June 2, 1998). It consists of two sections: (1) a listening

comprehension section and (2) a grammar and reading comprehension section. For this

study, students were given only the French grammar and reading comprehension portion

of the exam, consisting of a total of 64 questions. The grammar section consists of 32

multiple-choice questions on discrete grammar points. According to the technical

manual for the exam (Cohen, 1993, p. 32):

> The grammar items test a variety of morphological and syntactic forms, including
> adjective and article usage and agreement, verb forms and uses, pronoun forms and
> uses, expressions for comparison, negation and interrogation. In addition, some
> problems on verbs, prepositions, conjunctions, and adverbs are presented.

The reading comprehension section consists of 7 reading passages each followed by 2 to

7 multiple-choice questions. "This portion of the test was designed to be a proficiency-

based measure of student's understanding of ideas in context" (Cohen, 1993, p. 32).

Reliabilities for the Grammar (GMR), Reading Comprehension (Reading), and Total

Grammar plus Reading Comprehension (R&G) sections of the test are reported in

Table 4.

Table 4. French Test (Form 901): Summary statistics

Grammar	
Mean	14.29
Standard Deviation	6.82
Reliability	**.873**
Standard Error	2.93
No. of items	32
No. examinees	793
Reading	
Mean	17.17
Standard Deviation	6.74
Reliability	**.862**
Standard Error	2.50
No. of items	32
No. examinees	1,014
G&R	
Mean	24.68
Standard Deviation	12.66
Reliability	**.923**
Standard Error	3.51
No. items	64
No. examinees	1,014

Note. From Technical Manual for Foreign Language Tests (p. 34), by A. S. Cohen, 1993,

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The reliability figures reported in Table 4 are "Cronbach's Alpha coefficients,

representing internal consistency reliability" (Cohen, 1993, p. 12). Reliabilities for the

Grammar (GMR), Reading Comprehension (Reading), and Total Grammar plus Reading

Comprehension (R&G) sections of the test are all above .86, and are deemed "sufficiently

reliable for use in making placement decisions" by the technical manual author (Cohen, 1993, p. 33).

Test validity "for placing students in the proper courses in the introductory language sequence" has been measured using numerous methods in a variety of studies since 1988 (Cohen, 1993, p. 35). For the sake of brevity, only the results from one such study, focusing on "recapture validity" will be reported.

According to Cohen (1993, p. 28), "Validation of placement tests requires establishing the extent to which we can use the test to predict the course or courses in a sequence in which the student will learn best." He asserts that the "recapture study" is one way to determine test validity:

> This methodology focuses on estimation of the extent to which the placement test can be used to place students back into the course in which they are currently enrolled. This approach is based on the assumption that the current placement is the desired placement for the student and that the new placement test should recapture that existing placement. The recapture study seeks to determine whether there is sufficient information in the test score(s) to place students back into their current course enrollment (Cohen, 1993, p. 28).

Results from a recapture study conducted at the University of Wisconsin – Eau Claire in Spring 1992 are reported in Table 5.

Table 5. French Recapture Study Summary Statistics

Course Level	Number Students	G&R Test	
		Mean	SD
1	48	16.94	4.82
2	48	21.06	7.03
3	7	31.57	6.13
4	11	41.64	11.42
5	9	48.00	9.53
Total Sample	123	23.86	11.97

Note. From Technical Manual for Foreign Language Tests (p. 35), by A. S. Cohen, 1993,

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The means in Table 5 show that, as expected, there is a gradual increase for the Grammar

and Reading Comprehension score as the level of course increases. Cohen (1993, p. 36)

also reports the correlations between the three section of the placement test, as shown in

Table 6.

Table 6. French Test Correlations for UW – Eau Claire Recapture Study

	Grammar	Reading	Listening
Grammar			
Reading	.733		
G&R	-	-	.818
Listening	.745	.776	

Note. From Technical Manual for Foreign Language Tests (p. 36), by A. S. Cohen, 1993,

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Cohen (1993, p. 35) asserts that the "moderately high" correlations among the

subsections of the placement test "suggest that all of the subscores are measuring

approximately the same underlying ability, knowledge of the French language at the

introductory level."

Overall results from the recapture study revealed "the best recapture percentage was

52.03 from the combined G&R plus Listening tests" (Cohen, 1993, p. 36). Although the

author expressed a desire to have percentages "in the 70's or even higher," the French placement test is considered valid for the purposes for which it was designed.

The time limit specified in the instructions for the exam is 60 minutes. Due to strict scheduling guidelines at the Air Force Academy, the exam could only be given within a regular 50-minute class. Students were advised of the time limit before the start of the exam. The majority of students had no trouble completing the exam within 50 minutes. Students recorded their answers on computer-scorable forms, called "digiteks," that were machine-scored at the Air Force Academy.

The exam was used to provide general information as to the proficiency levels of the participants, and to establish a set of base proficiency data for comparison with outcome variables. The mean score out of a possible 64 for the 42 students in the study was 40.1, with a standard deviation of 8.0. Scores ranged from a low of 24 to a high of 55.

Attitude questionnaire

In order to determine participants' attitudes about the usefulness of either interactive networking, or computer-assisted writing skills practice as pre-writing activities, students completed a post-study questionnaire (See Appendix I). The majority of the attitude questionnaires were completed immediately following the second composition of the study. An administrative error necessitated the reaccomplishment of the remaining questionnaires. All questionnaires were submitted to the researcher within three weeks of the second composition.

Due to the similarity of contexts, questions were modeled after those developed by Ittzes (1997). The questionnaire consisted of both closed- and open-ended questions. "A closed item is one in which the range of possible responses is determined by the researcher ..." (Nunan, 1992, p. 143). In this case, there were 20 closed-item questions, with the following six responses: "strongly agree, agree, somewhat agree, somewhat disagree, disagree, and strongly disagree." The typical "neutral" or "undecided" position was eliminated in order to avoid the possibility of "fence-sitting." There were also 8 open-ended questions in order for students to provide more elaborate responses about their likes and dislikes about both CMC and *Système-D*, as well as their impressions of the time limits for each phase of the study.

Answers for the 20-closed item questions were recorded on computer-scorable "digiteks." Points were automatically assigned to the "letter" responses in the following manner: A. strongly agree = 6, B. agree =5, C. somewhat agree = 4, D. somewhat disagree = 3, E. disagree = 2, and F. strongly disagree = 1. The digiteks were machine-scored at the University of Arizona.

The analysis of the attitude questionnaires (reported in Chapter 4) is broken down into four sections: (1) responses related to the use of CMC, (2) responses related to the use of *Système-D*, (3) a comparison of similar questions for the two activities, and (4) responses to the open-ended questions for both activities. Overall means and standard deviations are reported for the first two sections. Questions with high or low means are discussed in detail.

In the third section, similarities and differences are presented for those questions that are identical for the two pre-writing activities. In addition, a matched t-test is performed in order to determine whether or not the difference in means found for those questions related to CMC and those related to *Système-D* are statistically significant. For this analysis, several manipulations of the data were necessary. Question #6 from the attitude questionnaire ("I did not see any advantage to taking notes during CMC activities") was eliminated from consideration because subjects were not required to take notes during the actual data collection phase of the study (See CMC section of this chapter for a detailed discussion.) Question #11 ("I did not enjoy interacting with my classmates during CMC activities") was eliminated because a positively worded statement, Question #3 ("I enjoyed the opportunity to interact with my classmates during CMC activities") provided redundancy on this issue. Questions #17 and #18 ("I experienced technical difficulties while working with CMC/*Système-D*") were reverse coded so that responses showing disagreement were interpreted as positive attitudes toward either CMC or *Système-D*. Last, question #20 ("I did not obtain useful information while participating in CMC") was reverse coded so that negative responses were interpreted as positive attitudes toward CMC.

In the last section of analysis for responses to the attitude questionnaire, a qualitative analysis of responses to open-ended questions is presented.

Timeline

This study was conducted over a period of four weeks during the first half of the 1998 spring semester. Data collection was scheduled around the constraints of the instructors involved in the study and the availability of the networked classroom. Back-to-back class sessions which did not include a weekend (i.e. Tuesday – Thursday) were chosen for the pre-writing and writing sessions. A summary chart of the scheduled activities and the dates on which they occurred is found in Table 7.

Table 7. Timeline for data collection

Practice session	Jan 21, 1998
Background questionnaire and MBTI	Jan 21-23, 1998
Wisconsin Placement Exam	Jan 23, 1998
Pre-writing session #1	Jan 27, 1998
Composition #1	Jan 29, 1998
Pre-writing session #2	Feb 10, 1998
Composition #2	Feb 12, 1998
Attitude questionnaire	Feb 12-14, 1998

Data analysis

Holistic evaluations

In order to determine overall writing quality, two experienced outside raters provided holistic scores for all of the compositions produced in each context. The original design of this study called for analytic scoring to be completed by each of the instructors.

According to Scott (1996, p. 114), "This method of scoring involves evaluating various features of a text, such as grammatical accuracy, vocabulary, idiomatic expression, organization, relevance, and coherence." The analytic scoring guide originally selected for this study (Hedgecock & Leftkowitz, 1992, as cited in Scott, 1996, p. 116) consisted of five features (content, organization, grammar, vocabulary, and mechanics) with subcategories of "excellent" to "very poor" described for each feature (See Appendix J). Each feature was "weighted" with different point ranges, e.g. 30 maximum points for content, 20 maximum points for grammar, and 5 maximum points for mechanics. Even though the instructors had high interrater agreement on 3 "practice" compositions, the scale proved to be too complicated when evaluating the compositions for the study. Therefore, the researcher decided to have outside raters perform the evaluations using a simple, 10-point holistic scale.

The holistic scale used was "taken from Johnson's (1983) *Grading the Advanced Placement Examination in French Language*" (as cited in Scott, 1996, p. 113). The scale consists of 5 categories ("demonstrates superiority, demonstrates competence, suggests competence, suggests incompetence, demonstrates incompetence"), totaling 9 points, and one additional floating point for a "coherent and well-organized, or particularly inventive essay" (See Appendix K).

The two outside raters met on one occasion to grade three sample compositions. (It is important to note that rater #1 was a native speaker and experienced evaluator, but did not have recent classroom experience. Rater #2 was a non-native speaker with extensive

classroom experience.) Students enrolled in either French 223 or French 321 during the semester prior to the study wrote the sample compositions. The topic was similar in difficulty to those selected for the purposes of this study. This sample grading session ensured that the raters agreed on the numerical scale, given the expected proficiency level of the students. The raters then evaluated each of the 84 compositions in this study independently. Inter-rater reliability figures were calculated using the Spearman-Brown Prophesy Formula (Hatch, 1991, p. 533), listed in the Figure 5.

Figure 5. Spearman-Brown Prophesy Formula

$$r_{tt} = \frac{nr_{a,b}}{1 + (n-1)r_{a,b}}$$

where, r_{tt} = inter-rater reliability
$\quad\quad n$ = the number of raters whose combined estimates form the final mark
$\quad\quad\quad\quad$ for the examinees
$\quad\quad r_{a,b}$ = the correlation between the raters, or the average correlation among
$\quad\quad\quad\quad$ the raters if there are more than two

Microsoft Excel was used to calculate the Pearson product-moment correlation coefficients ($r_{a,b}$) necessary for this formula.

Due to low inter-rater reliability figures between the two raters on both sets of compositions (r_{tt} = .6717 for composition #1 and r_{tt} = .5989 for composition #2), a third rater was asked to perform the holistic evaluations. Pearson product-moment correlation coefficients ($r_{a,b}$) for scores from this third rater (a non-native speaker with extensive classroom experience) with those of rater #2 (also a non-native with extensive classroom experience) were as follows: $r_{a,b}$ = .773 for composition #1, and $r_{a,b}$ = .491 for

composition #2. Inter-rater reliability figures (for raters #2 and #3) were as follows: $r_{tt} =$ .87 for composition #1 and $r_{tt} = .66$ for composition #2. Therefore scores assigned by Rater #1 (the native French speaker) were dropped. Overall writing quality was obtained by adding the scores given by Rater #2 and Rater #3 for each composition, for a possible 20 points.

Computer text analysis

In response to research question #1, compositions from both the CMC and *Système-D* writing groups were assessed in terms of a variety of performance variables, including (a) total number of words, (b) grammatical accuracy, (c) lexical density, (d) lexical diversity, (e) syntactic complexity, and (f) overall writing quality. *Wordsmith Tools*, a text analysis software package, was used to provide information for three of these performance variables: lexical density, lexical diversity and syntactic complexity (via the total number of sentences). *Grammatik*, the grammar check of the Novell Tools software package was used to determine grammatical accuracy, as well as syntactic complexity (via the total number of coordinating and subordinating conjunctions). Before describing *Wordsmith Tools* and *Grammatik* in detail, each of these performance variables will be defined below.

lexical density – Lexical density is defined by Laufer and Nation (1995, p. 309) as the "percentage of lexical words in the text (i.e. nouns, verbs, adjectives, adverbs.)" As stated by Laufer and Nation (1995, p. 309), "Since lexical words are the words which primarily convery information, a text is considered 'dense' if it contains many lexical

words relative to the total number of words, i.e. lexical and functional words." Lexical

words are "words which have a statable lexical meaning (e.g. book, red, run)" (Crystal,

1992, p. 160).

Crystal (1992, p. 160) defined a function word as follows:

> A word with no lexical meaning, whose function is solely to express a grammatical
> relationship; also called a grammatical word, form word, structural word, functor, or
> empty word. English examples include *the*, *of*, and *to* (as in *I want to see*).

lexical diversity – Lexical diversity, also known as type/token ratio, is defined as the total

number of different words (types) divided by the total number of words (tokens) in a text.

syntactic complexity – Syntactic complexity is defined here in terms of three factors: (1)

the total number of sentences, (2) the number of coordinating conjunctions, and (3) the

number of subordinating conjunctions. Although a number of second language research

studies commonly use T-units in determining syntactic complexity (Gaies, 1980; Larsen-

Freeman, 1983), because of software limitations, this was not available in the present

study. Hunt (1965) was the first to introduce T-unit analysis. A T-unit is defined as the

main clause and all its dependent clauses. Analysis of the basic T-unit has expanded both

in first and second language research to include: "(1) Number of words per T-unit, (2)

Number of T-units per sentence, (3) Number of clauses per T-unit, and (4) Number of

words per clause" (Grabe & Kaplan, 1996, p. 43). Second language research has also

focused on "error-free" T-units, "now considered to be a more valid measure of growth in

a second language" (Gaies, 1980, p. 55). In order to accurately assess "error-free" T-

units, however, "one must define both the unit (clause or T-unit) and what 'error-free'

means" (Polio, 1997, p. 113). Polio (1997, p. 114) notes that studies using error-free T-unit analysis often do not provide interrater reliability information, nor definitions of what was considered an error.

T-unit analysis has several other shortcomings. Gaies (1980, pp. 57) claims that T-unit analysis "does not appear to be particularly appropriate for the analysis of data from subjects with relatively low proficiency" due to the large number of grammatical and lexical errors produced by these subjects. This may lead to inaccurate counts of T-units, or error-free T-units. Gaies (1980, p. 58) also asserts that T-unit analysis lacks "discriminating power." While it may be useful to distinguish between high and low proficiency students, "it is not as sensitive an indicator of second language development as might be desired" (Gaies, 1980, p. 58).

Several researchers have advocate sentence-based analysis as an alternative to T-unit analysis (Bardovi-Harlig, 1992; Gaies, 1980). Gaies (1980, p. 58) claims that in both first and second language acquisition, "sentences tend to be combined first primarily by coordination. Subordination is more heavily used at the next stage of development; and finally, sentence-embedding and clause reduction become the principal means of consolidating and structuring information."

The computer text analysis tools used in this study were able to provide number of coordinating conjunctions, subordinating conjunctions, average sentence length, and total number of sentences in a text. Syntactic complexity was therefore calculated using the following formula developed by the researcher:

Figure 6. Syntactic complexity formula

Syntactic complexity (Syn) = $\dfrac{\text{\# of coordinating conjunctions} + \text{\# of subordinating conjunctions}}{\text{Total number of sentences}}$

(Although average sentence length was not included in the formula, its relatively high correlation with the total number of coordinating and subordinating conjunctions [$r_{a,b}$ = .768] meant that it was adequately accounted for.)

Wordsmith Tools is "an integrated suite of programs for looking at how words behave in texts" (Intro to *Wordsmith Tools* software package). Machine requirements to run this software are as follows: "IBM-compatible (at least 386) running 3.1 or greater. Hard disk with at least 2 Mb free for the programs alone" (README file of software package). *Wordsmith Tools* consists of five major programs: (1) a word list program, (2) a concordancer, (3) a keywords program, (4) a splitter program, and (5) a text converter program. Each of these programs is described on the Internet (http://www1.oup.co.uk/oup/elt/software/wsmith) as follows:

Wordlist: generates word lists in alphabetical and frequency order so that you can compare texts lexically; also provides statistics like total number of different words, type/token ratio, length of words, number of sentences, length of sentences, and more.

Concordancer: creates concordances (lists of a word in context); finds collocates of the search word; identifies common phrases (clusters around the word) in the concordance.

Keywords: identifies keywords in a given text. Keywords are those whose frequency is unusually high in comparison with a more general corpus. You can use this to characterize a text of a genre. Displays a graphical map showing where each keyword occurs in the corpus.

Splitter: a program for splitting large files into many smaller ones

Text converter: a program for converting text in a number of files. It uses a translation file so that it knows which symbols or strings to convert. It does a "search and replace" much as in word-processors, but it can do this on up to 16, 000 text files, one after the other.

The *Wordlist* program was the tool used to provide the information necessary for the text analyses in this study.

In addition to generating word lists based on inputted text files, the *Wordlist* program calculates a variety of detailed statistics under the menu item "Full Statistics," including the total number of sentences, the average word length, the average sentence length, the type/token ratio (or lexical diversity), and the lexical density. The program works only with ASCII or ANSI text files. "Words," "sentences" and "type/token ratio" (or lexical diversity are defined by the program as follows:

words – a sequence of valid characters with a word separator at each end. Valid characters include all the letters from A to Z, plus all accented characters which can be used in the current character set, plus any user-defined acceptable characters to be included with a word (such as the apostrophe or hyphen)

sentences – the full-stop, question-mark or exclamation-mark (.?!) immediately followed by one or more word separators and then a capital letter A .. Z or an accented capital letter, a number or a currency symbol

type/token ratio (*or lexical diversity*) – the total number of different words (types) divided by the total number of words (tokens) in a text. The type/token ratio (mean) is computed every *n* words as Wordlist goes through each text file. By default, *n* equals 1,000. In other words, the ratio is calculated for the first 1,000 running words, then calculated afresh for the next 1,000, and so on to the end of your text or corpus.

In order for the program to provide accurate calculations for the texts of this study, it was necessary to determine the minimum text length, and then to change the default setting

for the type/token ratio. The *n* used for the type/token calculations in this study was 50 words.

It was also necessary to provide a "stop-list" made up of function words (See Appendix L). *Wordsmith Tools* defines stop-lists as "lists of words which you don't want to include in analysis. For example, you might want to make a word list or analyze key words excluding common function words like *the, of, was, is, it*" (*Wordsmith Tools*: stop lists). The stoplist was used to eliminate function words from the lexical density calculations. In order to construct the most complete function word list possible, information was gathered from three separate sources: (1) a function word list in English (found on the Internet at http:// www.stir.ac.uk/epd/celt/staff/higdox/funcword.htm), (2) a glossary in French of prepositions, adverbs and adjectives that link sentence parts together ("Colle Française," found on the Internet at http://www.fourmilab.ch/francais/glue.html), and (3) a French grammar text, *Collage: Révision de grammaire* (Baker, Bleuzé, Border, Grace, Owen & Williams-Gascon, 1996). The function word list in English was translated by the researcher, and cross-referenced with the French glossary of prepositions, adverbs and adjectives. The grammar text was used as a reference to ensure all forms of pronouns and possessive pronouns were included in the final function word list. (Please note that the function word list is probably longer than necessary for this particular study, but every effort was made to ensure the list was as comprehensive as possible. Misspellings, especially due to lack of accents, were included in order for *Wordsmith Tools* to count function words even though

students may have misspelled them. The final function word list, or "stop-list," consisted of 346 words.)

The *Wordsmith Tools* program adequately performed calculations of lexical density, lexical diversity and the total number of sentences necessary for this analysis.

Grammatik is the French version of the Novell Advanced Technology Division Collexion Grammar Checker. According to the software's literature, "The Collexion Grammar Checker not only finds grammar and spelling errors, but it also recommends appropriate writing styles and formality levels. … The Collexion Grammar Checker also provides document analyses and statistical summaries." It was used here to determine grammatical accuracy, as well as the total number of coordinating and subordinating conjunctions for each composition.

This software package finds a variety of errors, summarized in Table 8:

Table 8. Types of errors found by the Collexion Grammar Checker

Error	Description
Spelling	Provides spelling verification, fast look-up, morphological analysis and corrections.
Mechanical Errors	Detects missing punctuation, such as parentheses and periods. Finds double words or punctuation, and capitalization errors.
Stylistic Errors	Suggestions for incorrectly formed idiomatic expressions. Suggests replacements for archaic words and for cliches, jargon and colloquial expressions. Flags commonly confused and look-alike words which appear to have been misused in the context.
Language Clarity	Encourages clear writing by suggesting replacements for superfluous words and for redundant expressions.
Grammatical Errors- Agreement	Determines if a noun/verb agreement is correct. This is language dependent. English has just subject/verb agreement. Other languages have adjective/noun, or past participle/direct object agreement. In each language the Collexion Grammar Checker is able to detect many agreement errors by looking at the output of the parser.
Grammatical Errors- General Sentence Structure	Finds missing subjects or other syntactic functions, including word order problems and wrong tense. Identifies run-on sentences, incomplete sentences, missing articles, etc.

While *Grammatik* provided a function to select the types of errors you were interested in, it provided statistics based on the total number of errors found. Therefore, only errors that fell under the categories of spelling, agreement and general structure were considered in determining grammatical accuracy. After an initial screening of 25% of the total number of compositions, the researcher tallied the scores provided by *Grammatik* for the following types of errors: spelling, gender/number, determiners, agreement of tout, contractions, inversions, prepositions, pronouns and auxiliaries. Spelling errors were included since the program was not able to distinguish between a simple spelling error and a grammatical mistake. Even with human intervention, it would be impossible to

distinguish incorrect verb endings, as an example, as spelling errors or grammatical mistakes. After tallying the number of errors for each text, the total number of errors was divided by the number of words in that text. The grammaticality score is therefore a ratio of errors to total number of words for each composition. Obviously, the lower the ratio, the better the grammatical accuracy score.

Mechanical, stylistic and language clarity errors were ignored. Although the program literature claims "to display fewer false errors than any other grammar checker," it can not be considered 100% accurate. It can, however, be consistent in its calculation of grammatical errors across the sample of compositions analyzed. Additionally, the grammatical accuracy scores showed a high correlation with the score for the grammar section of the Wisconsin placement exam ($r_{a,b}$ = -.60 for composition #1 and $r_{a,b}$ = -.60 for composition #2). (Note that the negative correlations mean that the lower the ratio of errors to total number of words, the higher the score on the grammar section of the Wisconsin placement exam.) These correlations suggest internal consistency of instruments used to determine grammatical accuracy. On the whole it is the researcher's opinion that the *Grammatik* program provided a good indicator of grammaticality for each composition in the study.

The total number of coordinating and subordinating conjunctions was determined using a "search and find" function within *Grammatik*. In order to perform these calculations, it was necessary to provide a list of coordinating and subordinating conjunctions. The program limited each of these lists to 80 characters. After scanning

the compositions and consulting a French grammar text, *Grammaire française* (Dubois,

Jouannon & Lagane, 1961), the following coordinating and subordinating conjunctions

were included in the lists:

Coordinating conjunctions: *et, ou, ni, mais, or, car*, and *donc*

Subordinating conjunctions: *parce que, quand, lorsque, avant que, bien que, quoique, si,*

comme and *tellement que*

Subordinating conjunctions that were most likely not present in the student compositions

(for example, *puisque, afin que, de peur que* and *de même que*) were not included in the

list.

The research performed a screening of coordinating and subordinating within the

concordance provided by the *Grammatik* program. A conjunction such as *et* (and) may or

may not be considered a coordinating conjunction depending on the context. If it is used

to link two subjects, for example *Michelle et Pierre,* it is not a coordinating conjunction

and was therefore eliminated from the total count.

As stated earlier (see Figure 6), syntactic complexity was calculated by adding the

total number of coordinating and subordinating conjunctions for a given composition and

dividing it by the total number of sentences for that composition.

Statistical tests

In order to determine the effects of the independent variables on the dependent

variables in this study, a multiple regression model was used. According to Hatch &

Lazaraton (1991, p. 467), "Regression is a way of predicting performance on the

dependent variable via one or more independent variables." Results from this statistical analysis will explain the amount of variance in each of the dependent variables, which is uniquely contributed by one or more of the independent variables. In statistical terms, "Multiple regression analysis generates R^2, an index of the proportion of variation in the dependent variable (Y) that is predictable from the set of independent variables (X's)" (Shavelson, 1996, p. 529).

According to Shavelson (1996, p. 536), four assumptions must be met in order for multiple regression analysis to perform accurate calculations:

1. Independence: The scores for any particular subject are independent of the scores of all other subjects.
2. Normality: In the population, the scores in the dependent variable are normally distributed for each of the possible combinations of the level of the X variables.
3. Homoscedasticity: In the population, the variance of the dependent variable for each of the possible combinations of the levels of the X variables are equal.
4. Linearity: In the population, the relation between the dependent variables and an independent variable is linear when all other variables are held constant.

The scores from the subjects in this study were indeed independent of the scores for all other subjects. Therefore, the first assumption has been met.

In order to test for normality, the researcher looked at both histograms of residuals and normal probability plots for each of the dependent variables (as suggested by the Statistical Package for the Social Sciences (SPSS) Base System User's Guide [Norussis, 1990, pp. 260-261]). A residual is defined as "the difference between an observed value and the value predicted by the model" (Norussis, 1990, p. 257). The histograms for each of the dependent variable in the study showed a normally distributed bell-shaped curve, signaling that there had been no violation of the normality assumption.

Normal probability plots were also considered for each of the dependent variables. If the observed values approximated a straight line, the normality assumption had not been violated. The plots for each of the dependent variables in the study approximated a straight line, indicating no apparent violation of the normality assumption.

For homoscedasticity and linearity, the researcher looked at standardized scatterplots of predicted values versus residual values for each of the dependent variables. According to the SPSS Base System User's Guide (Norussis, 1990, p. 257), "If the assumptions of linearity and homogeneity of variance are met, there should be no relationship between the predicted and residual values." In other words, the plots should appear to be random. The scatterplots for each of the dependent variables in this study indeed appeared to be random, indicating no apparent violation of the homoscedasticity and linearity assumptions.

In addition to the assumptions, a final concern is that of sample size. According to Shavelson (1996, p. 536), "there should be at least 10 times as many cases (subjects) as independent variables." Therefore, with a sample size of 42 subjects for this study, there should be no more than four independent variables considered at any one time. The ratio of sample size to independent variables was important for this study. A detailed discussion of the approach used to adjust the ratio for this study is included in Chapter 4. All statistical analyses were conducted by the Statistical Package for the Social Sciences (SPSS) for mainframe.

An overview of the research questions, the measurement instruments and the data
analysis procedures is shown in Table 9.

Table 9. Overview of research questions, measurement instruments, and data analysis
procedures

Research Questions	Measurement Instruments and Data sources	Data Analysis
1. What are the effects of collaborative computer-mediated discussion and non-collaborative computer-assisted writing skills practice on L2 writing? ■ difference in grammatical accuracy ■ lexical density and diversity ■ syntactic complexity ■ overall writing quality	■ compositions ■ computed by grammar checker ■ computed by text analysis software ■ computed by text analysis software ■ holistic grades as assigned by instructors	■ step-wise multiple regression in order to determine the effect of the two pre-writing activities on the dependent variables
2. How do individual learner differences (including age, gender, major, GPA, and prior study) relate to quantity and quality of performance in the two contexts? ■ demographic variables ■ personal characteristics	■ computerized database (Q2) ■ background questionnaire	■ after initial screening of variables, pertinent variables correlated with performance outcome variables described under research question #1 ■ variables of interest subjected to step-wise multiple regression to determine which variables account for variance in the dependent variables

Table 9. Overview of research questions, measurement instruments, and data analysis

procedures (continued)

3. How do attitudes toward each of the pre-writing activities (interactive networking and computer-assisted writing skills practice) relate to quantity and quality of performance in the two contexts?	▪ post-activity questionnaire (Likert-scale and open-ended questions)	▪ independent analysis of attitude "scores" toward each of the pre-writing activities, including discussion of high and low means, and comparison of scores for the two pre-writing activities ▪ matched t-test to determine statistical significance of differences in means found for those questions related to CMC and those related to *Système-D* ▪ qualitative analysis of responses to open-ended questions
4. How do personality factors relate to quantity and quality of performance in the two contexts?	▪ MBTI personality test	▪ Correlations between personality scores (4 scales) and the performance outcome variables ▪ stepwise multiple regression to determine the effects of personality on the dependent variables
5. How does language proficiency relate to quantity and quality of performance in the two contexts?	▪ Wisconsin Foreign Language Placement Exam	▪ correlations between exam scores and the performance outcome variables ▪ stepwise multiple regression to determine the effects of proficiency scores on the dependent variables
6. What are the advantages and disadvantages of using computer text analysis programs in assessing L2 texts	▪ computerized results for writing samples	▪ qualitative analysis of researcher's experiences with computer text analysis programs

CHAPTER 4
RESULTS

Introduction

Chapter 3 explained the research design for this study, including research site and subjects, data collection methods and instruments. It also detailed data analysis procedures and statistical tests used to answer the research questions. This chapter will present the results of the data analysis procedures and statistical tests. The research questions will provide the overall framework for this chapter.

Research question #1: What are the effects of collaborative computer-mediated discussion and non-collaborative computer-assisted writing skills practice on L2 writing? "Effects" will be described in terms of six variables: (a) total number of words, (b) grammatical accuracy, (c) lexical density, (d) lexical diversity, (e) syntactic complexity, and (f) overall writing quality.

This question is the primary focus of the study. Analysis was performed to determine if, indeed, there were different effects on L2 writing based on students' participation in either (1) collaborative computer-mediated communication (CMC), or (2) non-collaborative writing skills practice (in this case, *Système-D*).

Descriptive information for the independent variables (IV's) is listed in Table 10.

Table 10. Descriptive information for the independent variables

Variable	Mean	Standard deviation	Minimum	Maximum
Gender	0.31	0.47	0.00	1.00
WISC score	40.21	8.17	24.00	55.00
GPA	3.00	0.54	1.39	3.85
E/I	-0.48	15.15	-26.00	26.00
T/F	-5.71	12.29	-32.00	16.00
CMC/Sys-D	.50	.51	.00	1.00

Note that gender is a nominal variable. For the purposes of statistical analysis, males were arbitrarily assigned the value of 0, and females the value of 1. A mean of .31 for gender indicates a larger number of males than females participated in the study.

"WISC score" refers to the score each subject received on the University of Wisconsin French Placement Exam grammar and reading comprehension section, consisting of a total of 64 questions. The grammar section consists of 32 multiple-choice questions on discrete grammar points. The reading comprehension section consists of 7 reading passages each followed by 2 to 7 multiple-choice questions. Out of a possible 64 points, students' scores ranged from a minimum of 24 points to a high of 55 points. The mean WISC score was 40.21.

"GPA" refers to each student's cumulative grade point average. Students' GPA's ranged from a high of 3.85 to a low of 1.39. The average GPA for the 42 subjects in this study was 3.00.

"E/I" refers to a student's score on the extraversion/introversion scale of the Myers-Briggs Type Indicator (MBTI) self-scorable personality test (Form G) (Myers & Myers, 1987a, 1987b). A minus sign for this variable indicates scores closer to the extroverted

pole of the extroverted/introverted continuum. A mean score of -.48 for the E/I variable indicates that there is a slightly larger percentage of extraverts than introverts involved in the study. (For additional information about the percentages of each personality type in this study, see Table 3 in Chapter 3.)

"T/F" refers to a student's score on the thinking/feeling scale of the Myers-Briggs Type Indicator (MBTI) self-scorable personality test (Form G) (Myers & Myers, 1987a, 1987b). A minus sign for this variable indicates scores closer to the thinking pole of the thinking/feeling continuum. A mean score of -5.71 for the T/F variable indicates that there are a larger percentage of thinkers than feelers involved in the study.

"CMC/Sys-D" is the variable indicating a subject's participation in either (1) collaborative computer-mediated discussion (CMC), or (2) non-collaborative, computer-assisted writing skills practice, in this case *Système-D* (Sys-D). Like gender, CMC/Sys-D is also a nominal variable. For the purposes of statistical analysis, CMC participation was arbitrarily assigned the value of 1, and *Système-D* participation the value of 0. A mean of .50 for CMC/Sys-D indicates that an equal number of subjects participated in both CMC and *Système-D*.

In order to answer the research question above, it is important to present descriptive information for the dependent variables (DV's) (for both composition #1 and composition #2) based on subjects' participation in either CMC or *Système-D*. Table 11 provides descriptive information for the dependent variables for those subjects who participated in CMC:

Table 11. Descriptive information for dependent variables based on CMC participation

Variable	Mean	Standard deviation	Minimum	Maximum
Total Words 1	326.43	77.69	166.00	497.00
Lexical Diversity 1	52.89	4.01	45.78	60.24
Lexical Density 1	35.80	2.98	27.88	41.26
Syntactic Complexity 1	.32	.15	.09	.70
Quality 1	13.00	2.72	8.00	19.00
Grammar 1	.14	.04	.08	.22
Total Words 2	371.52	96.14	248.00	632.00
Lexical Diversity 2	45.13	4.97	31.80	54.03
Lexical Density 2	31.80	3.30	22.31	37.10
Syntactic Complexity 2	.29	.11	.17	.59
Quality 2	12.43	1.83	10.00	16.00
Grammar 2	.17	.05	.06	.26

Note. The sample size (N) is 42.

The "1" for each of the dependent variables in the top half of Table 11 refers to data obtained from the subjects' first composition. The "2" for each of the dependent variables in the lower half of Table 11 refers to data obtained from the second composition.

The "Total Words" variable refers to the total number of words in each composition. *Wordsmith Tools*, the computer text analysis software used in this study, provided the total word count for each composition.

"Lexical Diversity," also known as type/token ratio, is defined as the total number of different words (types) divided by the total number of words (tokens) in a text. *Wordsmith Tools* provided the lexical diversity figures for all compositions in the study.

"Lexical Density" is defined as the "percentage of lexical words in the text (i.e. nouns, verbs, adjectives, adverbs.)" (Laufer and Nation, 1995, p. 309). *Wordsmith Tools*

provided the lexical density figures by using a "stop-list," which eliminated function words from the lexical density calculations.

"Syntactic Complexity" is defined here in terms of three factors: (1) the total number of sentences, (2) the number of coordinating conjunctions, and (3) the number of subordinating conjunctions. *Wordsmith Tools* and *Grammatik* provided the number of coordinating conjunctions, subordinating conjunctions, and total number of sentences in each composition. Syntactic complexity consisted of a ratio of the total number of coordinating and subordinating conjunctions to the total number of sentences for each text. (For justification, see Chapter 3, Computer Text Analysis section.)

"Quality" refers to the overall writing quality for each composition as assessed by two experienced outside raters. Raters used a 10-point holistic scale (Appendix K), "taken from Johnson's (1983) *Grading the Advanced Placement Examination in French Language*" (as cited in Scott, 1996, p. 113). Overall writing quality was obtained by adding the scores given by the two raters for each composition, for a possible 20 points.

"Grammar" refers to the grammatical accuracy of each composition. *Grammatik*, the grammar check of the Novell Tools software package was used to determine grammatical accuracy. Scores provided by *Grammatik* were tallied for the following types of errors: spelling, gender/number, determiners, agreement of *tout*, contractions, inversions, prepositions, pronouns and auxiliaries. The total number of errors was divided by the total number of words for each text. The grammaticality score is therefore a ratio of errors to total number of words for each composition. Obviously, the lower the ratio, the better the grammatical accuracy score.

Table 12 provides descriptive information for the dependent variables for those

subjects who participated in *Système-D*:

Table 12. Descriptive information for dependent variables based on *Système-D*

participation

Variable	Mean	Standard deviation	Minimum	Maximum
Total Words 1	374.52	96.33	198.00	547.00
Lexical Diversity 1	50.16	4.46	40.73	59.60
Lexical Density 1	34.53	3.04	27.80	39.22
Syntactic Complexity 1	.29	.17	.04	.77
Quality 1	12.71	2.69	8.00	18.00
Grammar 1	.13	.04	.08	.24
Total Words 2	401.48	99.42	212.00	632.00
Lexical Diversity 2	43.12	4.71	35.21	50.76
Lexical Density 2	31.03	3.43	25.27	38.84
Syntactic Complexity 2	.30	.16	.03	.77
Quality 2	11.24	2.39	7.00	15.00
Grammar 2	.20	.06	.12	.33

Note. The sample size (N) is 42.

Exploratory analysis was conducted by running multiple regressions on each of the

dependent variables, using forced entry for the independent variables. This means that all

six of the IV's were entered as predictors of each of the DV's. With all of the IV's in the

equations, the variable of primary interest (CMC or *Système-D* participation) accounted

for less of the variance in each of the dependent variables than when a stepwise approach

was used with the regressions. This led to lower t-values and higher significance values

(chance of Type I errors). (See Appendix M for multiple regression results using forced

entry for the independent variables.)

The same regressions were run again using the stepwise regression for the first five

independent variables (listed in Table 10) and forced entry for the CMC/*Système-D*

variable. In stepwise regression, the IV must have a significance level less than a criterion value (in this case .05) in order to be entered as a predictor of the DV. In other words the IV must have a significant effect on the DV within a certain error level (.05) to be entered into the regression model. Each IV is considered separately to determine how much it affects the DV. After consideration was made for the first five IV's, the CMC/*Système-D* variable was then entered into the regression equation, regardless of its significance. Although less variance in the DV is accounted for by the stepwise method, it only includes IV's that have a real effect on the DV. It also allows for more degrees of freedom, which leads to higher effect sizes for the variable of primary interest (i.e., CMC/*Système-D*).

Table 13 through Table 24 disclose multiple regression (MR) results for each of the dependent variables, using forced entry for the CMC/*Système-D* variable and stepwise regression for the other independent variables.

Table 13 shows the multiple regression results for Total Words 1.

Table 13. Multiple Regressions results for Total Words 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
CMC/SD	.05031	-1.781	.0825	Gender	.674	.5046
				WISC	.718	.4771
				GPA	-.303	.7638
				E/I	-.293	.7710
				T/F	1.761	.0861

Note. The level of α is set at .05 and the sample size (N) is 42.

This table is divided into two major columns: "Variables in the Equation" and "Variables not in the Equation." As mentioned above, the CMC/SD variable will be in

the equation for each dependent variable due to forced entry. Any other independent variable that appears in the equation must have a significant effect on the dependent variable at the .05 level. Independent variables that are not significant at the .05 level appear in the "Variables not in the Equation" column. R^2 is the coefficient of determination. It reveals the amount of variance in one variable accounted for by another. (In some cases, R^2 reveals the amount of variance in one variable accounted for by two or more other variables, as shown later in Table 15.) "Adjusted" R^2 simply means that R^2 has been adjusted for sample size. The "T" statistic listed in Table 10 (as well as the tables that follow) tests whether there is a significant difference in the predicted values of the dependent variable with that of the independent variable in the equation. For example, if CMC/SD were a significant indicator of Total Words 1, there would be a high value of T in the regression analysis and a low significance value (Sig. T). The significance value tells you the probability of no difference in the population, or of making a Type I error. Any significance value below the designated alpha (in this case .05) allows you to reject the null hypothesis and conclude that statistical differences exist.

Table 13 shows that group membership (i.e., participation in either CMC or *Système-D*) did not contribute significantly to the variance in Total Words 1 at the .05 level.

Table 14 shows the multiple regression results for Lexical Diversity 1.

Table 14. Multiple Regressions results for Lexical Diversity 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
CMC/SD	**.07533**	2.083	**.0437**	Gender	-.617	.5406
				WISC	-.115	.9089
				GPA	.434	.6665
				E/I	.306	.7612
				T/F	-1.984	.0543

Note. The level of α is set at .05 and N = 42.

Table 14 reveals that group membership contributed significantly to the variance in Lexical Diversity 1. In other words, there is a significant relationship between being a member of the CMC or *Système-D* group and the lexical diversity of composition #1. The group mean for Lexical Diversity 1 was significantly higher for the CMC (52.89) group than the *Système-D* group (50.16). Group membership accounted for 7.5% of the variance in Lexical Diversity 1.

Table 15 shows the multiple regression results for Lexical Density 1.

Table 15. Multiple Regression results for Lexical Density 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
T/F	**.13102**	-2.464	**.0183**	Gender	.374	.7104
CMC/SD		1.405	.1680	WISC	-.031	.9758
				GPA	-.505	.6164
				E/I	-.656	.5159

Note. The level of α is set at .05 and N = 42.

Group membership did not contribute significantly to the Lexical Density 1 variable at the .05 level, as shown in Table 15. However, the thinking/feeling variable was

significant at the .05 level. The cumulative contribution of the thinking/feeling variable

and group membership to variance in Lexical Density 1 was 13%.

Table 16 shows the multiple regression results for Syntactic Complexity 1.

Table 16. Multiple Regression results for Syntactic Complexity 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
CMC/SD	-.01317	.683	.4984	Gender	1.039	.3052
				WISC	-.040	.9681
				GPA	-.556	.5812
				E/I	-1.760	.0862
				T/F	1.037	.3061

Note. The level of α is set at .05 and N = 42.

Group membership did not contribute significantly to the Syntactic Complexity 1

variable at the .05 level, as shown in Table 16.

Table 17 shows the multiple regression results for Quality 1.

Table 17. Multiple Regression results for Quality 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
WISC	.29376	4.346	.0001	Gender	-.277	.7836
CMC/SD		.374	.7108	GPA	-.608	.5466
				E/I	.772	.4449
				T/F	-1.218	.2307

Note. The level of α is set at .05 and N = 42.

Multiple regression analysis showed that participation in either CMC or *Système-D*

did not contribute significantly to the Quality 1 variable. However, the cumulative

contribution of the Wisconsin placement exam score and group membership to variance

in Quality 1 was 29.4%, as shown in Table 14. (Note the extremely low value of Sig. T. This means that the probability of making a Type I error are 1 in 10,000.)

Table 18 shows the multiple regression results for Grammar 1.

Table 18. Multiple Regression results for Grammar 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
WISC	**.31238**	-4.392	**.0001**	Gender	-1.092	.2819
CMC/SD		1.194	.2396	GPA	.738	.4648
				E/I	.713	.4802
				T/F	-.094	.9253

Note. The level of α is set at .05 and N = 42.

Table 18 reveals that group membership did not contribute significantly to the variance in Grammar 1. However, the cumulative contribution of the Wisconsin placement exam score and group membership to the variance in Grammar 1 was 31.2%, as shown in Table 18. (Note once again the extremely low value of Sig. T.)

Table 19 shows the multiple regression results for Total Words 2.

Table 19. Multiple Regression results for Total Words 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
CMC/SD	-.00037	-.992	.3269	Gender	1.504	.1407
				WISC	-.282	.7792
				GPA	-1.159	.2537
				E/I	.172	.8646
				T/F	.934	.3558

Note. The level of α is set at .05 and N = 42.

Table 19 shows that group membership (i.e. participation in either CMC or *Système-D*) did not contribute significantly to the Total Words 2 variable at the .05 level.

Table 20 shows the multiple regression results for Lexical Diversity 2.

Table 20. Multiple Regression results for Lexical Diversity 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
CMC/SD	.01949	1.347	.1855	Gender	-.589	.5594
				WISC	.809	.4236
				GPA	1.202	.2367
				E/I	-.698	.4892
				T/F	-.340	.7355

Note. The level of α is set at .05 and N = 42.

Table 20 reveals that group membership did not contribute significantly to the variance in

lexical diversity 2.

Table 21 shows the multiple regression results for Lexical Density 2.

Table 21. Multiple Regression results for Lexical Density 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
CMC/SD	-.01093	.746	.4600	Gender	-.304	.7626
				WISC	.268	.7899
				GPA	.448	.6566
				E/I	-.016	.9877
				T/F	-.215	.8305

Note. The level of α is set at .05 and N = 42.

Group membership did not contribute significantly to the Lexical Density 2 variable at

the .05 level, as shown in Table 21.

Table 22 shows the multiple regression results for Syntactic Complexity 2.

Table 22. Multiple Regression results for Syntactic Complexity 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
CMC/SD	-.02342	-.248	.8050	Gender	1.188	.2421
				WISC	1.023	.3126
				GPA	.532	.5978
				E/I	-1.119	.2698
				T/F	1.337	.1890

Note. The level of α is set at .05 and N = 42.

Table 22 shows that group membership did not contribute significantly to the Syntactic

Complexity 2 variable at the .05 level.

Table 23 shows the multiple regression results for Quality 2.

Table 23. Multiple Regression results for Quality 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
WISC	.46136	5.598	.0001	Gender	.998	.3246
CMC/SD		2.355	.0236	GPA	-1.011	.3185
				E/I	-.009	.9925
				T/F	.469	.6418

Note. The level of α is set at .05 and N = 42.

The results of multiple regression analysis for Quality 2 were similar to those found for

Quality 1. Participation in either CMC or *Système-D* did not contribute significantly to

the Quality 2 variable. However, the cumulative contribution of the Wisconsin

placement exam score and group membership to variance in Quality 2 was 46.1%, as

shown in Table 23. (Note the extremely low value of Sig. T. This means that the

probability of making a Type I error are 1 in 10,000.)

Table 24 shows the multiple regression results for Grammar 2.

Table 24. Multiple Regression results for Grammar 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T		T	Sig. T
WISC	**.24811**	-3.367	**.0017**	Gender	-2.006	.0520
CMC/SD		-2.017	.0506	GPA	.072	.9432
				E/I	.714	.4795
				T/F	-.393	.6967

Note. The level of α is set at .05 and N = 42.

Multiple regression analysis results for Grammar 2 were also similar to those found for

Grammar 1. Table 24 reveals that group membership did not contribute significantly to

the variance in Grammar 2. However, the cumulative contribution of the Wisconsin

placement exam score and group membership to the variance in Grammar 2 was 24.8%,

as shown in Table 24. (Note once again the extremely low value of Sig. T.)

To recap, the effects of group membership on L2 writing were statistically significant

for two of the dependent variables. For Lexical Diversity 1, the mean score for the

Système-D group was 50.16. For those who participated in CMC, the mean score for this

variable was 52.89. Group membership accounted for 8% of the variance in Lexical

Diversity 1.

Group membership was also statistically significant for the overall quality score given

for composition 2. The mean score for the *Système-D* group was 11.24. The mean score

for the CMC group was 12.43. The Wisconsin placement exam score together with

group membership accounted for 46% of the variance in Quality 2.

These results from multiple regression analyses are consistent with the correlations

obtained between the CMC/*Système-D* variable and all other variables considered in this

study. Table 25 shows correlational data between the CMC/*Système-D* variable and the

six dependent variables for composition #1 discussed in this section.

Table 25. Correlations among the dependent variables for composition #1 and the

CMC/*Système-D* variable

Variable	CMC/*Système-D*
Total words 1	$r_{a,b} = -.2711$ $p = .083$
Lexical diversity 1	$r_{a,b} = \mathbf{.3129}$ $\mathbf{p = .044}$
Lexical density 1	$r_{a,b} = .2116$ $p = .179$
Syntactic complexity 1	$r_{a,b} = .1074$ $p = .498$
Quality 1	$r_{a,b} = .0541$ $p = .734$
Grammar 1	$r_{a,b} = .1496$ $p = .344$

Microsoft Excel was used to calculate the Pearson product-moment correlation

coefficients ($r_{a,b}$) reported in Tables 25 through 38.

Note that Lexical Diversity 1 was the only variable to reach significance for composition

#1 ($p \leq .05$).

Table 26 shows correlational data between the CMC/*Système-D* variable and the six

dependent variables for composition #2 discussed in this section.

Table 26. Correlations among the dependent variables for composition #2 and the

CMC/*Système-D* variable

Variable	CMC/*Système-D*
Total words 2	$r_{a,b} = -.1550$ $p = .327$
Lexical diversity 2	$r_{a,b} = .2083$ $p = .185$
Lexical density 2	$r_{a,b} = .1172$ $p = .460$
Syntactic complexity 2	$r_{a,b} = -.0393$ $p = .805$
Quality 2	$r_{a,b} = .2757$ $p = .077$
Grammar 2	$r_{a,b} = -.2772$ $p = .075$

None of the dependent variables reached significance for composition #2.

In summary, the effects of participating in either collaborative computer-mediated discussion or non-collaborative computer-assisted writing skills practice on L2 writing, in terms of the six variables considered (total number of words, grammatical accuracy, lexical density, lexical diversity, syntactic complexity, and overall writing quality) were minimal.

Research questions #2: How do individual learner differences (including age, gender, major, and GPA) relate to quantity and quality of performance in the two contexts?

As mentioned in Chapter 3, individual learner differences, including age, gender, major, GPA and proficiency, were collected as part of this study to identify those characteristics that may relate to performance outcome variables.

Due to the large number of undeclared majors (over 50% of the subjects) and the limited range of ages of subjects (19 to 22 years old), major and age were not considered in the following statistical analyses.

Multiple regression results, as shown previously in Table 13 through Table 24, revealed that gender and GPA did not contribute significantly to the variance in any of the dependent variables for composition 1 or composition 2. For gender, these results are consistent with the correlation data between gender and all 12 dependent variables. Table 27 shows correlational data between gender and the six dependent variables for composition #1.

Table 27. Correlations among the dependent variables for composition #1 and gender

Variable	Gender
Total words 1	$r_{a,b} = .1439$ $p = .363$
Lexical diversity 1	$r_{a,b} = -.1407$ $p = .374$
Lexical density 1	$r_{a,b} = -.0550$ $p = .730$
Syntactic complexity 1	$r_{a,b} = .1446$ $p = .361$
Quality 1	$r_{a,b} = -.0613$ $p = .700$
Grammar 1	$r_{a,b} = -.1458$ $p = .357$

None of the dependent variables reached significance for composition #1.

Table 28 shows correlational data between gender and the six dependent variables for composition #2.

Table 28. Correlations among the dependent variables for composition #2 and gender

Variable	Gender
Total words 2	$r_{a,b} = .2524$ $p = .107$
Lexical diversity 2	$r_{a,b} = -.1229$ $p = .438$
Lexical density 2	$r_{a,b} = -.0658$ $p = .679$
Syntactic complexity 2	$r_{a,b} = .1905$ $p = .227$
Quality 2	$r_{a,b} = .0517$ $p = .745$
Grammar 2	$r_{a,b} = -.2023$ $p = .199$

None of the dependent variables reached significance for composition #2.

Table 29 shows correlational data between GPA and the six dependent variables for composition #1, and Table 30 shows correlational data between GPA and the six dependent variables for composition #2.

Table 29. Correlations among the dependent variables for composition #1 and GPA

Variable	GPA
Total words 1	$r_{a,b} = -.0385$ $p = .809$
Lexical diversity 1	$r_{a,b} = .0565$ $p = .722$
Lexical density 1	$r_{a,b} = .0307$ $p = .847$
Syntactic complexity 1	$r_{a,b} = -.0914$ $p = .565$
Quality 1	$\mathbf{r_{a,b} = .3131}$ $\mathbf{p = .044}$
Grammar 1	$\mathbf{r_{a,b} = -.3063}$ $\mathbf{p = .049}$

Table 30. Correlations among the dependent variables for composition #2 and GPA

Variable	GPA
Total words 2	$r_{a,b} = -.1755$ $p = .266$
Lexical diversity 2	$r_{a,b} = .1785$ $p = .258$
Lexical density 2	$r_{a,b} = .0676$ $p = .671$
Syntactic complexity 2	$r_{a,b} = .0859$ $p = .588$
Quality 2	$\mathbf{r_{a,b} = .3268}$ $\mathbf{p = .035}$
Grammar 2	$r_{a,b} = -.2844$ $p = .068$

(Recall that the grammaticality score is a ratio of errors to total number of words for each composition. Therefore, the lower the ratio, the better the grammatical accuracy score.) For GPA, correlational data reveals that GPA reached significance for three of the dependent variables. For composition # 1, both Quality 1 and Grammar 1 reached significance (see Table 29). This means that subjects with higher GPA's received higher scores for overall quality and produced fewer grammatical errors for composition #1, and conversely, subjects with lower GPA's received lower scores for overall quality and produced more grammatical errors for composition #1. For composition #2, only Quality 2 reached significance (see Table 30).

Therefore, in response to this research question, gender did not have a significant impact on quantity and quality of writing in the two contexts considered in this study. GPA, on the other hand, was significantly correlated with three of the dependent variables in the study: Quality 1, Grammar 1, and Quality 2.

Research question #3: How do personality factors relate to quantity and quality of performance in the two contexts?

As mentioned in Chapter 3, only two scales of the MBTI were used for statistical analyses: (1) Extraversion/Introversion scale and (2) Thinking/Feeling scale.

Multiple regression results presented in Table 13 through Table 24 in response to Research Question #1 revealed that the Extraversion/Introversion (E/I) variable did not contribute significantly to the variance in any of the dependent variables for composition 1 or composition 2. These results are consistent with the correlation data between the E/I variable and all 12 dependent variables. Table 31 shows correlational data between the E/I variable and the six dependent variables for composition #1.

Table 31. Correlations among the dependent variables for composition #1 and the Extraversion/Introversion (E/I) variable

Variable	E/I
Total words 1	$r_{a,b} = -.0494$ $p = .756$
Lexical diversity 1	$r_{a,b} = .0515$ $p = .746$
Lexical density 1	$r_{a,b} = .0307$ $p = .847$
Syntactic complexity 1	$r_{a,b} = -.2680$ $p = .086$
Quality 1	$r_{a,b} = .2083$ $p = .185$
Grammar 1	$r_{a,b} = -.0135$ $p = .932$

None of the dependent variables reached significance for composition #1.

Table 32 shows correlational data between E/I and the six dependent variables for composition #2.

Table 32. Correlations among the dependent variables for composition #2 and the Extraversion/Introversion (E/I) variable

Variable	E/I
Total words 2	$r_{a,b} = .0247$ $p = .877$
Lexical diversity 2	$r_{a,b} = -.1053$ $p = .507$
Lexical density 2	$r_{a,b} = -.0006$ $p = .997$
Syntactic complexity 2	$r_{a,b} = -.1769$ $p = .262$
Quality 2	$r_{a,b} = .1242$ $p = .433$
Grammar 2	$r_{a,b} = .0052$ $p = .974$

None of the dependent variables reached significance for composition #2.

Multiple regression results presented in Table 13 through Table 24 revealed that the Thinking/Feeling variable contributed significantly to the variance in only one of the dependent variables for composition 1 or composition 2. As stated previously, the thinking/feeling variable was significant at the .05 level for Lexical Density 1 (see Table 15). The cumulative contribution of the thinking/feeling variable and group membership to variance in Lexical Density 1 was 13%. These results are consistent with the correlation data between the T/F variable and all 12 dependent variables. Table 33 shows correlational data between the T/F variable and the six dependent variables for composition #1.

Table 33. Correlations among the dependent variables for composition #1 and the

Thinking/Feeling (T/F) variable

Variable	T/F
Total words 1	$r_{a,b} = .2665$ $p = .088$
Lexical diversity 1	$r_{a,b} = -.2937$ $p = .059$
Lexical density 1	$\mathbf{r_{a,b} = -.3627}$ $\mathbf{p = .018}$
Syntactic complexity 1	$r_{a,b} = .1607$ $p = .309$
Quality 1	$r_{a,b} = -.1694$ $p = .283$
Grammar 1	$r_{a,b} = -.0058$ $p = .971$

Only Lexical Density 1 reached significance for composition #1. The negative

correlation between the thinking/feeling variable and Lexical density 1 indicates that the

higher a subject scored on the feeling scale of the MBTI, the lower their score for Lexical

density 1. Conversely, subjects who scored higher on the thinking scale of the MBTI had

higher scores for Lexical density 1.

Table 34 shows correlational data between T/F and the six dependent variables for

composition #2.

Table 34. Correlations among the dependent variables for composition #2 and the

Thinking/Feeling (T/F) variable

Variable	T/F
Total words 2	$r_{a,b} = .1492$ $p = .346$
Lexical diversity 2	$r_{a,b} = -.0573$ $p = .719$
Lexical density 2	$r_{a,b} = -.0365$ $p = .818$
Syntactic complexity 2	$r_{a,b} = .2099$ $p = .182$
Quality 2	$r_{a,b} = .0381$ $p = .810$
Grammar 2	$r_{a,b} = -.0407$ $p = .798$

None of the dependent variables reached significance for composition #2.

Therefore, in response to this research question, the Extraversion/Introversion (E/I)

variable and the Thinking/Feeling variable had minimal effect on L2 writing, in terms of

the six variables considered (total number of words, grammatical accuracy, lexical

density, lexical diversity, syntactic complexity, and overall writing quality). The only

exception to this was the significance of the Thinking/Feeling variable on Lexical

Density 1. As stated previously, the cumulative contribution of the Thinking/Feeling

variable and participation in either CMC or *Système-D* to variance in Lexical Density 1

was 13%.

Research question #4: How does language proficiency relate to quantity and quality of performance in the two contexts?

Multiple regression results presented in Table 13 through Table 24 revealed that proficiency, as determined by the Wisconsin placement exam, contributed significantly to the variance in four of the dependent variables: Quality 1, Grammar 1, Quality 2 and Grammar 2. The cumulative contribution of the Wisconsin placement exam score and group membership to variance in Quality 1 was 29.4% (see Table 17), and to variance in Quality 2, 46.1% (see Table 23). The cumulative contribution of the Wisconsin placement exam score and group membership to the variance in Grammar 1 was 31.2% (see Table 18), and to variance in Grammar 2, 24.8% (see Table 24).

These results are consistent with the correlation data between the Wisconsin placement exam score (WISC) and all 12 dependent variables. Table 35 shows correlational data between WISC and the six dependent variables for composition #1.

Table 35. Correlations among the dependent variables for composition #1 and the Wisconsin placement exam score (WISC)

Variable	WISC
Total words 1	$r_{a,b} = .1075$ $p = .498$
Lexical diversity 1	$r_{a,b} = -.0147$ $p = .926$
Lexical density 1	$r_{a,b} = .0034$ $p = .983$
Syntactic complexity 1	$r_{a,b} = -.0055$ $p = .973$
Quality 1	$r_{a,b} = .5708$ $p = .000$
Grammar 1	$r_{a,b} = -.5675$ $p = .000$

For composition #1, both Quality 1 and Grammar 1 reached significance. This means that subjects with higher scores on the grammar and reading comprehension sections of the University of Wisconsin French Placement Exam received higher scores for overall quality and produced fewer grammatical errors for composition #1. Conversely, subjects with lower WISC scores received lower scores for overall quality and produced more grammatical errors for composition #1.

Table 36 shows correlational data between WISC and the six dependent variables for composition #2.

Table 36. Correlations among the dependent variables for composition #2 and the Wisconsin placement exam score (WISC)

Variable	WISC
Total words 2	$r_{a,b} = -.0460$ $p = .772$
Lexical diversity 2	$r_{a,b} = .1274$ $p = .421$
Lexical density 2	$r_{a,b} = .0437$ $p = .784$
Syntactic complexity 2	$r_{a,b} = .1612$ $p = .308$
Quality 2	$\mathbf{r_{a,b} = .6440}$ $\mathbf{p = .000}$
Grammar 2	$\mathbf{r_{a,b} = -.4584}$ $\mathbf{p = .002}$

For composition #2, both Quality 2 and Grammar 2 reached significance (see Table 36). The results are identical to those found for composition #1. Subjects with higher WISC scores received higher scores for overall quality and produced fewer grammatical errors

for composition #2. Conversely, subjects with lower WISC scores received lower scores for overall quality and produced more grammatical errors for composition #2.

In summary, statistical analysis revealed that there was a significant relationship between proficiency, as determined by the Wisconsin placement exam, and two of the dependent variables for each composition: (1) overall writing quality, and (2) grammatical accuracy.

Research question #5: What are students' attitudes toward the two pre-writing activities used in this study: (a) collaborative computer-mediated discussion and (b) non-collaborative computer-assisted writing skills practice?

This research question addresses participants' attitudes about the usefulness of either interactive networking (also known as computer-mediated communication or CMC), or computer-assisted writing skills practice (in this case, *Système-D*) as pre-writing activities. Attitudes were assessed through the use of a post-study questionnaire (Appendix I). 41 out of the 42 subjects participating in the study completed the questionnaire. The questionnaire consisted of 20 closed-item questions, with the following six responses: "strongly agree, agree, somewhat agree, somewhat disagree, disagree, and strongly disagree." As noted in Chapter 3, the neutral position was eliminated in order to avoid the possibility of "fence-sitting." In order to facilitate machine scoring, answers for the 20 closed-item questions were recorded on "digiteks." Points were automatically assigned to the "letter" responses in the following manner: A. strongly agree = 6, B. agree = 5, C. somewhat agree = 4, D. somewhat disagree = 3, E.

disagree = 2, F. strongly disagree = 1. Of these 20 questions, 11 were focused on the use

of CMC (numbers 1, 2, 3, 6, 7, 9, 11, 13, 15, 17, and 20), and 9 were focused on the use

of *Système-D* (numbers 4, 5, 8, 10, 12, 14, 16, 18, and 19). There were also 8 open-ended

questions in order for students to provide more elaborate responses about what their likes

and dislikes about both CMC and *Système-D*, their impressions of the time limits for each

phase of the study, and any additional comments they had concerning the study. Results

from the attitude questionnaire are presented here and are broken down into four sections:

(1) responses related to the use of CMC, (2) responses related to the use of *Système-D*,

(3) a comparison of similar questions for the two activities, and (4) responses to the open-

ended questions for both activities.

(1) Responses related to the use of CMC

Overall means on a 6-point scale from 1 to 6 (1 = strongly disagree; 6 = strongly

agree) and standard deviations for the 11 questions related to CMC are reported in Table

37.

Table 37. Attitude questionnaire results for questions related to CMC

Questions related to CMC	Mean Statistic	Std. Dev. Statistic
1. Participated enthusiastically in CMC	4.81	1.02
2. CMC helped me write a better composition	3.46	1.30
3. Enjoyed the opportunity to interact during CMC	5.00	.97
6. Saw no advantage to taking notes during CMC	4.46	1.45
7. CMC should be used more often in class	3.79	1.51
9. Enjoyed the self-paced nature of writing during CMC	4.49	1.04
11. Did not enjoy interaction w/classmates during CMC	2.14	1.24
13. More motivated to write composition after CMC	3.22	1.13
15. More confident about writing after using CMC	3.30	1.37
17. Experienced technical difficulties with CMC	1.68	.71
20. Did not obtain useful information from CMC	3.81	1.37

Note. The sample size (N) is 41.

Due to the scoring system used, means of 4.0 or above indicate the students' level of

agreement, and means below 4.0 indicate the students' level of disagreement. Several of

the responses are noteworthy. Clearly, students enjoyed the opportunity to interact

during CMC (mean = 5.00) (Their responses are further validated by a low mean of 2.14

when asked if they did not enjoy interacting with their classmates in question #11.)

Students also felt strongly about the lack of value of taking notes during CMC activities

as evidenced by question #6 (mean = 4.46). They felt that they had indeed participated

enthusiastically in the CMC activities (mean = 4.81), and they did not experience

technical difficulties during the sessions (mean = 1.68). Finally, students enjoyed the

self-paced nature of writing during CMC (mean = 4.49).

(1) Responses related to the use of *Système-D*

Overall means on a 6-point scale from 1 to 6 (1 = strongly disagree; 6 = strongly agree) and standard deviations for the 9 questions related to *Système-D* are reported in Table 38.

Table 38. Attitude questionnaire results for questions related to *Système-D*

Questions related to *Système-D*	Mean Statistic	Std. Dev. Statistic
4. Enjoyed working independently with Sys-D	5.14	.95
5. More confident about writing after using Sys-D	4.38	1.16
8. Participated enthusiastically in Sys-D	5.03	.80
10. Sys-D helped me write a better composition	5.14	.82
12. Was able to obtain useful information from Sys-D	5.30	.70
14. Sys-D should be used more often in class	5.35	.72
16. Beneficial to take notes during Sys-D	5.41	.83
18. Experienced technical difficulties with Sys-D	1.68	.71
19. More motivated to write composition after Sys-D	4.49	1.15

Note. The sample size (N) is 41.

Students expressed extremely positive attitudes (means above 5.0) towards 6 out of the 9 questions related to the use of *Système-D*. Topping the list was the recognition of the usefulness of taking notes during *Système-D* (mean = 5.41). Next, students also felt strongly that *Système-D* should be used more often in class (mean = 5.35), and that they were able to obtain useful information from this program (mean = 5.30). Students were also convinced that *Système-D* helped them to write a better composition (mean = 5.14). Last, students enjoyed working independently with *Système-D* (mean = 5.14), and felt they had participated enthusiastically in the activity (mean = 5.03). The low mean of 1.68 denotes the lack of technical difficulty experienced by the students while using this software.

(3) A comparison of similar questions for the two activities

There was general agreement among participants on three separate questions concerning the two pre-writing activities. An overwhelming majority of participants felt that they participated enthusiastically in both pre-writing activities (89.2% for CMC; 97.2% for *Système-D*). The vast majority also enjoyed the interaction afforded by CMC (91.8%), as well as the independence associated with *Système-D* (91.8%). Finally, the majority of responses (97.2% for both activities) showed that participants experienced little technical difficulty (if any) in working with CMC or *Système-D*.

There were greater discrepancies in responses to questions concerning the effectiveness of each of the pre-writing activities. Clearly, participants showed more favorable attitudes toward *Système-D* as a pre-writing activity as opposed to CMC. 97.2% of respondents felt that *Système-D* helped them write a better composition, while only 51.3% felt the same way about CMC. Students were evidently more confident about their writing skills after working with *Système-D* (81%) rather than with CMC (only 43.2%). The vast majority (97.3) felt that taking notes during *Système-D* was beneficial to their writing, while 81% did not see any advantage to taking notes during CMC activities.

For a breakdown of percentages of participants who gave each of the six possible answers (strongly agree through strongly disagree) to each question, see Appendix N. Percentages of favorable responses (strongly agree, agree, and somewhat agree), and percentages of negative responses (strongly disagree, disagree, and somewhat disagree) are totaled below each question in Appendix N.

A matched t-test was performed on the means from the attitude questionnaire in order

to determine whether or not there was a statistical difference in the means reported in

Tables 37 and 38. Results from the matched t-test are reported in Table 39.

Table 39 – Matched t-test results for attitude questionnaire responses

	CMC	Système-D
Mean	4.05	5.06
t (observed)	-6.88	
p value	.001	

Note. The level of α is set at .05 and N = 37.

Results from the matched t-test show a statistical difference in the difference of means

reported for CMC and Système-D. This analysis shows a clear preference for Système-D

over CMC by the subjects in this study. This result was somewhat surprising given the

larger percentage of subjects who were extroverts (59.5%) as opposed to introverts

(40.5%), as determined by the Myers-Briggs Type Indicator (MBTI) self-scorable

personality test (Form G) (Myers & Myers, 1987a, 1987b). On the other hand, a clear

preference for Système-D over CMC made sense given the larger percentage of thinkers

(64.3%) than feelers (35.7%) (also determined by the MBTI) in the sample. One way to

try and explain this result was to perform correlations between the thinking and feeling

variables and (1) the mean scores for questions related to CMC (reported in Table 39),

and (2) the mean scores for questions related to Système-D (also reported in Table 39).

(In this case, raw data scores for both the thinking and feeling scales, rather than a

combined thinking /feeling score, were used in this analysis.) Table 40 shows the

correlation matrix for these four variables.

Table 40 - Correlation coefficients between the thinking (T) and feeling (F) variables and (1) the mean scores for questions related to CMC and (2) the mean scores for questions related to *Système-D*

	CMC mean	SD mean	T	F
CMC mean	1.00	.2491 (p = .137)	**-.4275 (p = .008)**	**.4810 (p =.003)**
SD mean	-	1.00	-.2281 (p =.175)	.2866 (p = .085)
T	-	-	1.00	**-.8867 (p = .000)**
F	-	-	-	1.00

Note. The level of α is set at .05 and N = 37.

There were three significant results (shown in bold face in Table 40) among these correlations. Not surprisingly, there was a high inverse relationship between a subject's thinking and feeling scores. That simply means that the higher the subject scores on the thinking scale of the thinking/feeling continuum, the lower he or she will score on the feeling scale.

Much more enlightening were the significant correlations between the CMC mean scores on the attitude questionnaire and both the thinking and feeling variables. The negative correlation (-.4275) between the CMC mean and the thinking variable indicates that the higher a subject scored on the thinking scale, the lower that subject evaluated CMC on the attitude questionnaire. Conversely, the positive correlation between the CMC mean and the feeling variable indicates that the higher a subject scored on the feeling scale, the higher that subject evaluated CMC on the attitude questionnaire.

(4) Responses to the open-ended questions for both activities

Students were given the opportunity to provide more elaborate responses concerning

their likes and dislikes in working with CMC and *Système-D* with the following four prompts:

What I liked best about CMC was:
What I liked least about CMC was:
What I liked best about *Système-D* was:
What I liked least about *Système-D* was:

They were also asked if they felt that they had enough time (1) to interact with CMC before writing a composition, (2) to use *Système-D* before writing a composition, and (3) to actually write their composition. This section will first provide a summary of responses concerning students' likes and dislikes, and then will provide their reactions to the time elements of the study.

Students' "likes" about working with CMC and *Système-D* varied a great deal. Table 41 gives an overview of the students' responses. The number listed alongside each response represents the number of times that answer was given. The percentage (given in parentheses) represents the portion of the total number of responses given for that particular response. (For a complete listing of responses concerning students' likes about working with CMC and *Système-D*, see Appendix O.)

Table 41. Overview of responses to "What I liked best about CMC/*Système-D*"

"What I liked best about CMC"	"What I liked best about *Système-D*"
Interaction 20 (40.8%)	Easy to look things up 17 (35.4%)
Fun 6 (12.2%)	Learned new vocabulary/grammar 8 (16.7%)
Improves conversational French skills 5 (10.2%)	Learned new phrases 6 (12.5%)
Negative responses, such as "not much" 5 (10.2%)	Got helpful information for composition 6 (12.5%)

The most popular responses (accounting for 63.2% of the total number of responses) to the prompt "What I liked best about CMC" were (1) "interaction," (2) "it's fun," and (3) "it improves conversational French skills." Among the other answers were responses, such as "learned about my classmates," "was able to practice written communication," and "enjoyed anonymous communication." Curiously, even when asked what they liked about CMC, 5 students gave negative responses, such as "didn't like it," "not much," "killed time," and "absolutely nothing." Only one student felt that CMC helped generate ideas for writing. There were 13 different responses to this prompt.

For *Système-D*, students acknowledged the following advantages: (1) "ease in looking things up," (2) "learning new vocabulary and grammar," (3) "learning new phrases," and (4) "obtaining useful information for the composition." These four answers accounted for 77.1% of the total number of responses given. Some of the other responses were (1) "a thorough information source," (2) "clear-cut definitions/explanations," and (3) "everything!" There were 10 different responses to this prompt.

Students' dislikes about both CMC and *Système-D* were also quite varied. Table 42 gives an overview of the students' responses. The number listed alongside each response represents the number of times that answer was given. The percentage (given in parentheses) represents the portion of the total number of responses given for that particular response. (For a complete listing of responses concerning students' dislikes about CMC and *Système-D*, see Appendix P.)

Table 42. Overview of responses to "What I liked least about CMC/*Système-D*"

"What I liked least about CMC"	"What I liked least about *Système-D*"
Useless to writing 7 (16.3%)	Limited vocabulary bank 13 (31.7%)
Classmates at similar level, and therefore not very helpful 6 (14.0%)	Nothing 10 (24.4%)
Other group members did not take it seriously 4 (9.3%)	Wanted to use it while actually writing the compositions 4 (9.8%)

Noteworthy among the responses to "What I liked least about CMC" were the opinions that (1) "it was useless to writing," (2) that "classmates were not helpful during interactions because they were all at a similar proficiency level," and (3) that "other group members did not take it seriously." Among some of the other disadvantages mentioned, students cited the speed of the conversation, the lack of useful information obtained from CMC interactions, and the opinion that CMC did not help with their writing. Two students felt that "writing got sloppy," due to the speed of the written conversations. Two students also mentioned the "ease of getting off subject" as a disadvantage of CMC. It also seemed striking that there were a total of 20 different responses to this prompt (as opposed to the 13 different responses when asked what they liked about CMC).

Students were quite clear about their dislikes concerning *Système-D*. By far the most frequent response (accounting for 31.7% of the total number of responses) was the limited vocabulary bank available to the students through *Système-D*. The next most popular response was "nothing!" 24.4% of the students could not list a single thing that they disliked about *Système-D*. Four students did not like the fact that they could not use *Système-D* when actually writing their compositions. Some of the other negative responses concerning *Système-D* were "it's boring," "it wasn't user-friendly at first," and

"it did not offer interaction." In contrast to the wide variety of dislikes cited for CMC, there were only a total of 14 different responses given for *Système-D*.

Students' responses to the open-ended time-related questions revealed that the majority of participants felt that they had sufficient time for each of the pre-writing activities (CMC and *Système-D*), as well as sufficient time to write their compositions. 36 out of the 40 returned questionnaires had responses to these questions; 4 students left these questions blank. When asked, "Did you have enough time to interact with CMC before writing a composition?" over half of the subjects who responded (22 out of 36, or 61%) answered "yes" without qualifying their answers. Seven subjects replied that they had "too much" or "more than enough" time. Three participants said "yes," but added that additional time would not have made any difference. Two others answered "yes," and added the following qualifiers: "Time was not so much a factor as the level of conversation," and "There was plenty of time, but then we didn't write until the next lesson, so I lost enthusiasm." Only two participants answered "no" to this question. One of these students wrote, "A few more days would have showed more improvement."

When asked "Did you have sufficient time to use *Système-D* before having to write a composition?" the vast majority of respondents (33 out of 36, or 92%) answered "yes." One of these students wrote, "One class period was ample time to collect enough grammar, rules and vocabulary." Another qualified her answer by adding, "I was able to organize my notes to be effective for the composition." Only two participants felt that they could have used more time. Finally, one student replied, "Yes and no, I liked just seeing what it had to offer, so I would have liked more time."

When asked if participants felt that they had enough time to write their compositions, over 75% of respondents (28 out of 36) answered either "yes," or "yes, more than enough." Three subjects felt that they could have used a little more time. One of these students wrote, "I could have used a little more time on the composition when I used *Système-D* because I had more material to work with." Only 5 participants answered that they did not have sufficient time. Comments from these students included: "I like to take my time and I was not able to," "Not enough time to check it over," and "Not really, I type slow [sic], so I could have written a lot more, but those accents got in the way – plus it was graded so I was constantly going back to my note sheet for spelling, etc."

The final open-ended question asked simply for any "additional comments." Twenty-seven out of the 41 respondants (nearly 66%) said "no," or left the question blank. Three subjects recommended adding *Système-D* to the curriculum. Other favorable comments regarding *Système-D* were: "I really enjoyed working with *Système-D*," "I want *Système-D* on my computer" and "It's worth its weight in gold!" Two subjects commented that *Système-D* needs a larger word bank. One of these subjects wrote: "The amount of information available with *Système-D* is very limited. Also, it would be difficult to find information if we were not spoonfed exactly what to search for." This subject made reference to the suggested topics of vocabulary, phrases and grammar given to the students as part of the pre-writing activity. Unfortunately, he did not explain why the information would have been difficult to find without the suggested search topics.

Three subjects recommended adding both CMC and *Système-D* to the curriculum. One subject added, "CMC would be more effective only if you can get everyone to

participate AND to have those participating to keep on track; talking about a specific topic." Another subject downplayed the value of CMC in the following statement: "Neither system replaced classroom teaching. *Système-D* could be use to supplement individual learning. The chat system was close to worthless."

In summary, while subjects were markedly interested in both CMC and *Système-D*, both quantitative and qualitative analysis of the attitude questionnaire responses showed a clear preference for *Système-D* over CMC.

Research question #6: What are the advantages and disadvantages of using computer text analysis programs in assessing L2 texts?

While not directly related to the substance of this dissertation, this question focuses on one of the research tools used to conduct analyses on subjects' compositions. As detailed in Chapter 3 (see Computer Text Analysis section), two software programs were used to assess a variety of performance variables related to the quantity and quality of the L2 texts, including (a) total number of words, (b) grammatical accuracy, (c) lexical density, (d) lexical diversity and (e) syntactic complexity. *Wordsmith Tools*, a text analysis software package, was used to provide information for three of these performance variables: lexical density, lexical diversity and syntactic complexity (via the total number of sentences). *Grammatik*, the grammar check of the Novell Tools software package was used to determine grammatical accuracy, as well as syntactic complexity (via the total number of coordinating and subordinating conjunctions).

Two major advantages of the computer text analysis programs were (1) feasibility of analysis and (2) consistency of data. The speed of both *Wordsmith Tools* and *Grammatik* made the analysis of 84 student compositions feasible within a relatively short amount of time. Because the compositions were written using *Microsoft Word* and saved on both floppy disk and a hard drive, running a single composition through both *Wordsmith Tools* and *Grammatik* for the first stage of analysis took a matter of minutes. Multiplying this effect for the analysis of 84 student compositions resulted in a considerable time savings.

Equally important as speed was the advantage of consistency of data analysis. Even with flaws, such as *Grammatik's* inability to distinguish incorrect verb endings as spelling errors or grammatical mistakes, the program assessed each composition with exactly the same criteria. Similarly, *Wordsmith Tools* provided data on the same basis throughout the analysis process, thereby minimizing errors.

However, using computer text analysis software also presented its own set of difficulties. There were at least two disadvantages noted during the course of this study: (1) inability of the software to provide certain text variables and (2) the learning curve associated with each of the computer text analysis programs. Both *Wordsmith Tools* and *Grammatik* had their shortcomings in providing detailed analysis of certain text variables. *Wordsmith Tools*, for example, was unable to provide T-units, common means of expressing syntactic complexity in second language acquisition research studies (Gaies, 1980; Larsen-Freeman, 1983). *Grammatik* was unable to provide exclusive grammatical error counts due to its inability to distinguish between simple spelling mistakes and

grammatical errors. These shortcomings may have led to imprecise calculations of the outcome performance variables.

A second disadvantage was the learning curve associated with the use of each of the computer text analysis programs. As an example, text formatting required by each of the software programs was not the same. One program required "text only" documents "without line breaks," while the other required either *Word Perfect* or *Microsoft Word* document files. Another example concerns the "stop-list," used in *Wordsmith Tools* to eliminate function words from the lexical density calculations (see Appendix L). The fact that the "stop-list" needed to be in all capital letters was not recognized until mistakes were noted in the early stages of data analysis. This led to trouble-shooting of the lexical density calculations until the problem was solved. The point to be made is that even with the speed and facility provided by the computer text analysis programs, a researcher must anticipate the learning process associated with these programs before he or she is completely comfortable with their operations.

Overall, the researcher considered the computer text analysis software to be more than adequate to perform the data analysis needed for this study.

Chapter summary

This chapter presented the results of the data analysis procedures and statistical tests in response to the six research questions. A discussion of the implications of the findings, as well as limitations of the study and suggestions for future research, is presented in Chapter 5.

CHAPTER 5
DISCUSSION AND CONCLUSION

Overview of study

This study compared the quantity and quality of writing produced by L2 students after participating in either collaborative, computer-mediated communication, or non-collaborative, writing skills practice. The writing skills program used in this study was *Système-D*: Writing Assistant for French (Noblitt & Pet, 1993). Students using *Système-D* were told to use this writing software primarily as a research tool, searching for vocabulary, grammatical points, and phrases that would assist them in writing their compositions during the following class session. Students participating in collaborative, computer-mediated communication used the chat mode of Microsoft Internet Explorer 4.0's Netmeeting to engage in synchronous computer conferencing as a precursor to writing their compositions. The subjects' compositions were then evaluated in terms of overall quality (by human raters) and by means of computer text analysis. Multiple regression analyses were performed in order to determine whether or not there were significant relationships between the outcome performance variables (total number of words, lexical diversity, lexical density, syntactic complexity, overall quality and grammatical accuracy) and participation in either CMC or *Système-D*. This study also addressed the possibility of significant relationships between individual learner differences, such as gender, GPA, selected personality factors, and language proficiency, and the quantity and quality of writing produced in the two contexts mentioned above. Last, this study addressed students' attitudes toward the two pre-writing activities used in

this study, (1) interactive networking and (2) computer-assisted writing skills practice, through a quantitative and qualitative assessment of their attitude questionnaire responses.

This chapter will review the pertinent findings for each of the research questions and discuss the implications of each finding in light of the theoretical background presented in Chapter 1, and the applicable background literature presented in Chapter 2. It will also address limitations of the study, and make suggestions for future research.

Summary of Findings

Research question #1: The primary focus of this study was to determine the effects of collaborative computer-mediated discussion and non-collaborative computer-assisted writing skills practice on L2 writing. "Effects" were described in terms of six variables: (a) total number of words, (b) grammatical accuracy, (c) lexical density, (d) lexical diversity, (e) syntactic complexity, and (f) overall writing quality. Definitions of each of these terms are provided here for the sake of review and for accessibility to the reader.

Total number of words refers to the total word count for each composition.

Grammatical accuracy was assessed through the use of *Grammatik*, the grammar check of the Novell Tools software package. Scores provided by *Grammatik* were tallied for the following types of errors: spelling, gender/number, determiners, agreement of *tout*, contractions, inversions, prepositions, pronouns and auxiliaries. The total number of errors was divided by the total number of words for each text. The grammaticality score is therefore a ratio of errors to total number of words for each composition.

Lexical density is defined as the "percentage of lexical words in the text (i.e. nouns, verbs, adjectives, adverbs.)" (Laufer and Nation, 1995, p. 309). *Wordsmith Tools* provided the lexical density figures by using a "stop-list," which eliminated function words from the lexical density calculations.

Lexical diversity, also known as type/token ratio, is defined as the total number of different words (types) divided by the total number of words (tokens) in a text. *Wordsmith Tools* provided the lexical diversity figures for all compositions in the study.

Syntactic complexity is defined here in terms of three factors: (1) the total number of sentences, (2) the number of coordinating conjunctions, and (3) the number of subordinating conjunctions. *Wordsmith Tools* and *Grammatik* provided the number of coordinating conjunctions, subordinating conjunctions, and total number of sentences in each composition. Syntactic complexity consisted of a ratio of the total number of coordinating and subordinating conjunctions to the total number of sentences for each text. (For justification, see Chapter 3, Computer Text Analysis section.)

Overall writing quality was determined by two experienced outside raters. Raters used a 10-point holistic scale (Appendix K), "taken from Johnson's (1983) *Grading the Advanced Placement Examination in French Language*" (as cited in Scott, 1996, p. 113). Overall writing quality was obtained by adding the scores given by the two raters for each composition, for a possible 20 points.

Findings: The effects of participating in either collaborative computer-mediated discussion or non-collaborative computer-assisted writing skills practice on L2 writing, in

terms of the six variables considered (total number of words, grammatical accuracy, lexical density, lexical diversity, syntactic complexity, and overall writing quality) were minimal. Multiple regression analyses showed that the effects of group membership on L2 writing were statistically significant for only two of the dependent variables: Lexical Diversity 1 (i.e., the lexical diversity of composition #1), and Quality 2 (i.e., the overall writing quality of composition #2).

Implications: There are several possible explanations for the minimal effects of group membership on the quantity and quality of compositions produced after either collaborative computer-mediated discussion or non-collaborative computer-assisted writing skills practice. First, group membership may not have led to more significant differences in the outcome performances variable due to the limited timeframe of this study. Perhaps if the study were expanded in order to collect similar data over the course of a semester or an entire school year, discernible differences would emerge in the data analysis. The fact that group membership *did* have a significant relationship to two of the dependent variables (Lexical Diversity 1 and Quality 2) indicates that further investigation of writing produced after collaborative computer-mediated discussion and after non-collaborative writing skills practice is warranted. In addition, although group membership did not lead to *statistically significant* differences in outcome variables, a comparison of the overall means for both groups (see Tables 11 and 12, Chapter 4) reveals several noteworthy trends: (1) the total number of words for *Système-D* participants was higher on both compositions, (2) the lexical diversity and lexical density

was higher for CMC participants on both compositions, and (3) higher overall quality ratings were given for CMC participants on both compositions. An expanded study of these two pre-writing activities and the performance variables included in this study may lead to statistically significant results that will either confirm or deny these trends.

A second possibility for the minimal effects of group membership is that in this study, interaction, indicative of the computer-mediated discussions, does not play the pivotal role it had in several of the studies discussed in Chapter 3 (Pica et al., 1991; Varonis & Gass, 1985; Doughty and Pica, 1986). Although subjects who participated in the computer-mediated discussions were reading and processing a great deal of input, and certainly producing more target language output than the computer-assisted writing skills practice group (by virtue of the fact that the CMC group was writing in French throughout their pre-writing sessions), this did not lead to superior output in terms of the outcome performance variables discussed in this study. It is important to clarify, however, the type of input processed by the students in this study. Students participated in target language writing with their peers. This means that the input may well have been imperfect. It cannot be compared, for example, to the teacher input used as a part of Doughty & Pica's (1986) study. It also means that the input may not be considered *authentic* L2 input in the linguistic sense since it was not produced by natives. (All three studies cited above used native speakers along with non-native speakers as either the focus of their investigation, or as controls for their study.) Nevertheless, the written communication produced during the computer-mediated discussions was certainly authentic in the functional sense since it "occurred originally as a genuine act of

communication" (Geddes & White, 1978, p. 137). It is certainly possible that this flawed input was responsible for the lack of discernible differences in the outcome performance variables.

Last is the possibility that *both* pre-writing activities were worthwhile in assisting students with their written compositions. The computer-mediated discussion group had the benefits of interaction and increased target language production, while the computer-assisted writing skills group had access to a computerized data base that provided valuable information in the form of vocabulary, grammar and phrases to assist them in the writing process. In the end, the performance outcome variables were very similar for both groups.

Research question #2: Data on individual learner differences, including age, gender, major, GPA and proficiency, were collected as part of this study to identify those characteristics that may relate to the quantity and quality of writing produced in the two computer-based contexts outlined above. However, as mentioned in Chapter 4, due to the large number of participants with undeclared majors and the limited range of subjects' ages, major and age were not considered in the statistical analyses of this study.

Findings: Multiple regression analyses showed that gender and GPA did not contribute significantly to the variance in any of the dependent variables for composition 1 or composition 2. Correlational data supported the finding that gender did not have a significant impact on the quantity and quality of writing in the two contexts considered in

this study. GPA, however, was significantly correlated with three of the dependent variables in the study: Quality 1 (i.e., the overall writing quality of composition #1), Grammar 1 (i.e., the grammatical accuracy of composition #1), and Quality 2 (i.e., the overall writing quality of composition #2).

Implications: The fact that gender did not play a discriminating role in the quantity and quality of writing in the two contexts is both consistent and inconsistent with previous research. As mentioned in Chapter 3, results from the Pica et al. (1991, p. 366) study did not show "gender as a discriminating factor in the frequency of negotiated interaction and its associated opportunities for the comprehension of input, feedback on production, and modification of output." However, other studies, such as those reviewed by Oxford et al. (1988), found a difference in the language learning strategies used by males and females. Particularly relevant from the Oxford et al. review was the finding that females were more apt to engage in conversational or input elicitation strategies than males. Applied to the present study, females might therefore benefit more from the computer-mediated discussions than the males, and gender would be a discriminating factor for the outcome performance variables of the written compositions. Statistical results in this study, however, proved otherwise. Due to the ambiguous results from this and other studies, it is reasonable to infer that the issue of gender differences in second language acquisition studies is still to be resolved.

The fact that there were high correlations between GPA and overall quality (as measured by two outside raters using a 10-point holistic scale) of both compositions and grammatical accuracy (as measured by Grammatik, the grammar check of the Novel Tools software package) of the first composition is consistent with a study by Gardner (1985b). The focus of his study was to determine the predictive value of the Modern Language Aptitude Test (MLAT) based on predictors such as academic average, French grades, and objective measures of French achievement. "In 9 out of 10 cases, the correlations between the MLAT and Academic Average are significant..." (Garder, 1990, p. 200). It is important to note that Gardner used high school students as subjects and correlated "academic average" (Gardner's terminology) with language aptitude. However, it seems likely that the high correlations would hold true for university students and also for indicators of foreign language writing proficiency, such as overall writing quality and grammatical accuracy. Results reported above show that indeed this was the case for this study.

Research question #3: The MBTI was used to identify selected characteristics that may relate to writing performance following participation in two very different pre-writing activities. As mentioned in Chapter 3, based on the results from studies focused on writing and personality differences (reviewed in Chapter 2) and the need to reduce the number of independent variables due to the small sample size, only two scales of the MBTI were used for statistical analyses: (1) Extraversion/Introversion scale and (2) Thinking/Feeling scale.

Findings: Multiple regression analyses showed that the Extraversion/Introversion variable and the Thinking/Feeling variable had minimal effects on L2 writing, in terms of the six variables considered (total number of words, grammatical accuracy, lexical density, lexical diversity, syntactic complexity, and overall writing quality). The only exception to this was the statistical significance of the Thinking/Feeling variable on Lexical Density 1 (i.e., the lexical density of composition #1).

Implications: It seems probable that personality type would have a significant impact on the types of individual preferences for language learning activities used in the classroom. However, in the context of this particular study, there was not a significant relationship between personality type (i.e., extroversion/introversion and thinking/feeling scales) and the outcome performance variables of the students' compositions. This means that, for the most part, extraverts and introverts, as well as thinkers and feelers, performed equally well on their compositions whether they participated in computer-mediated discussions or writing skills activities. This finding is inconsistent with Ittzes' (1997) findings concerning personality type and writing in the computer conferencing context. As mentioned in Chapter 2, Ittzes (1997) found significant effects of personality on three dependent variables: (1) errors of morphology, (2) mechanical errors and (3) lexical errors. During the subjects' computer conferencing sessions, extraverted students produced a greater number of morphological errors, mechanical errors and lexical errors than their introverted counterparts (Ittzes, 1997, pp. 129-130). However, it is difficult to

compare these results with those found in the present study due to a major difference in focus. Ittzes (1997) collected data on the writing produced *during* the computer conferencing sessions and compared it to writing produced in traditional pen-and-paper group journal assignments. The focus of the present study was to use computer conferencing and writing skills practice as pre-writing activities, and to compare the writing produced on timed compositions *after* subjects participated in either activity. (While the time element may be considered a confounding variable in this study, it should be noted that over 75% of the respondents to the attitude questionnaire felt that they had adequate time to complete their compositions.) While we can speculate that extraverts may have excelled during the computer conferencing sessions and introverts may have excelled at the individualized writing skills activities, there were no discernible differences in the compositions they wrote after engaging in the two activities.

As mentioned above, the only exception to the lack of significant relationship between personality type and performance on the written compositions was the relationship between the thinking/feeling variable and Lexical density 1. Thinkers were more apt to produce a greater number of content words on the first composition than feelers.

Research question #4: The University of Wisconsin foreign language placement exam (grammar and reading comprehension section, only) was used to provide general information as to the proficiency levels of the participants, and to establish a set of base proficiency data for comparison with outcome variables.

Findings: Multiple regression analyses revealed that proficiency, as determined by the Wisconsin placement exam, contributed significantly to the variance in four of the dependent variables – Quality 1 (i.e., the overall writing quality of composition #1), Grammar 1 (i.e., the grammatical accuracy of composition #1), Quality 2 (i.e., the overall writing quality of composition #2), and Grammar 2 (i.e. the grammatical accuracy of composition #2). Correlational data supported these findings. For both composition 1 and composition 2, subjects with higher scores on the grammar and reading comprehension sections of the Wisconsin placement exam received higher scores for overall quality and produced fewer grammatical errors. Conversely, subjects with lower scores on the placement exam received lower scores for overall quality and produced more grammatical errors for both compositions.

Implications: These findings indicate that level of proficiency, as determined by the French grammar and reading comprehension section of the Wisconsin foreign language placement exam, was a significant predictor of overall quality and grammatical accuracy for both compositions. It is possible that a subjects' performance on the written compositions was influenced less by participation in either of the two pre-writing activities than his or her base proficiency level.

In addition, these findings attest to the internal consistency of several of the data collection instruments used in this study. In order to determine overall quality, two experienced outside raters provided holistic scores for each of the compositions in the study. Grammatical accuracy was determined through the use of computer text analysis

software. Despite the inherent difficulties of holistic grading and the possibility of

inflated error counts from the text analysis program (due to its inability to distinguish

between spelling and morphological errors), results from these two procedures were

highly correlated with the data provided by the Wisconsin placement exam. While these

findings indicate the value of computer text analysis programs, this topic will be

addressed as part of the sixth research question.

Research question #5: In order to determine participants' attitudes about the usefulness of

either interactive networking, or computer-assisted writing skills practice as pre-writing

activities, students completed a post-study questionnaire (Appendix I).

Findings: While subjects were markedly interested in both CMC and *Système-D*, both

quantitative and qualitative analysis of the attitude questionnaire responses showed a

clear preference for *Système-D* over CMC. Students felt that they obtained more useful

information and were better equipped to write their compositions by using *Système-D*.

Curiously, they enjoyed both the opportunity to work independently with *Système-D*, and

the opportunity to interact with their classmates during CMC. 100% of the respondents

to the questionnaire felt that *Système-D* should be used more often in class, while only

48.6% had the same feeling towards CMC. Finally, 97.2% of questionnaire respondents

reported little or no technical difficulty in working with either *Système-D* or CMC.

Implications: As with previous research concerning computer conferencing (Beauvois, 1995; Kern, 1995), findings here confirmed students' favorable attitudes toward the interaction afforded by this type of communication. Just as the subjects' from Beauvois' (1995) study enjoyed getting to know their classmates better, this was cited as a positive aspect of CMC in the present study. However, an obvious difference between the present study and previous research is a preference for the more structured computer-based activity (i.e. *Système-D*) as opposed to the free-flowing discussion (i.e., CMC) in the computer medium. This might be explained by the difference in research design of various studies. While Kern (1995) compared the use of computer-mediated discussions with traditional classroom discussions and Ittzes (1997) compared CMC discussions with pen-and-paper group journals, the present study compared two computer-based pre-writing activities and the writing produced during subsequent timed composition writing sessions. It is possible that in previous research the excitement of using a computer over the more mundane foreign language learning activities influenced students' motivation and outcomes in the different environments. In the present study, both pre-writing activities were conducted on the computer. Rather than comparing a non-computer-based activity with a computer-based one, the computer in this case was a contextual element to both activities. In other words, by comparing CMC with another computer-based activity, the impact of computer use itself is diminished.

A second reason for the lack of enthusiasm for CMC in the present study was related to personality type. As explained in Chapter 4, the higher a subject scored on the thinking scale of the MBTI, the lower that subject evaluated CMC on the attitude

questionnaire. Conversely, the higher a subject scored on the feeling scale of the MBTI, the higher that subject evaluated CMC on the attitude questionnaire. As noted in Chapter 2, thinkers "make decisions based on objective analysis and logical sequences ..." (Tiberio & Hammer, 1993). Clearly, thinkers would favor the more structured nature of *Système-D* to the less structured environment of CMC. It is possible that the participants in this study perceived the data available to them through *Système-D* as more typical of "formal instruction," and as such perceived this activity as more beneficial to their learning. It is the researcher's opinion, however, that while *Système-D* provides some structure in terms of vocabulary, grammatical and functional categories, it cannot be considered as formal instruction. The micro-structure provided serves an explanatory function, but the students must navigate through the software on their own, and what they pull out it may or may not be cohesive.

This does not mean to imply that a choice of foreign language activities should be based on personality type, or solely on students' preferences. It does suggest, however, that by incorporating both types of activities into the foreign language curriculum, chances are that a greater percentage of preferences due to personality type will be accomodated for.

It is also noteworthy that unlike Oliva & Pollastrini's (1995) study, in which technical difficulties with the use of computers and a lack of experience with the Internet were cited as negatives, subjects in this study experienced little or no technical difficulties while working with CMC or *Système-D*. This might be accounted for by the nature of the students who participated in the present study. While there are fewer and fewer students

who have not experienced day-to-day use of computers in educational settings, students at the Air Force Academy are immersed in computer-based activities throughout their academic program. The ease with which students were able to adapt to both CMC and *Système-D* attests to their computer literacy. It may be difficult in future studies to find subjects who are *not* at ease in the computer environment.

Research question #6: This question dealt with a meta-analysis of the research tools in this study, specifically, the advantages and disadvantages of using computer text analysis programs in assessing L2 texts.

Findings: The two major advantages of using computer text analysis software were (1) feasibility of analysis (due to the speed with which analysis was conducted), and (2) consistency of data analysis. The two major disadvantages were (1) the inability of the software to provide certain text variables and (2) the researcher's learning curve associated with each of the computer text analysis programs.

Implications: It is the researcher's opinion that the advantages of using computer text analysis software in future research clearly outweigh the disadvantages. The ability of the software to provide data analysis quickly and consistently is invaluable. Research projects involving a significantly larger group of subjects than the present study would benefit a great deal from the capability afforded by computer text analysis software. Although there are shortcomings in the software that must be reported along with results

obtained, they should not preclude use of the software in future research. Researchers should allow enough time to familiarize themselves with the operation of any text analysis program and be able to troubleshoot any inconsistencies.

Limitations of the study

In light of the research findings, it is important to recognize several limitations of this research project that may have affected its outcomes.

First there is the limitation of sample size. Forty-two subjects enrolled in four separate sections presented a manageable group of subjects, given the time and resource constraints of this study. However, in order to examine a large number of independent and dependent variables, ideally there should be a minimum of ten subjects per independent variable (Shavelson, 1996, p. 536). A large number of subjects would also provide the variability necessary for analyzing the importance of certain individual learner differences, such as age, major and personality type. In this study, it was necessary to limit the number of independent variables analyzed due to the small sample size.

A second limitation related to the sample is the unique population of students involved in this project. Students at the Air Force Academy must meet rigorous selection criteria in academics, athletics, and community service work showing leadership potential, in order to be accepted for admission. Upon acceptance, students are required to follow a highly structured curriculum that focuses heavily on mathematical and engineering sciences. Grades for academic subjects (as well as for military and athletic classes) are of

utmost importance. The majority of these students will be commissioned as officers into the U.S. Air Force upon graduation. The rigorous standards of the military environment attract a particular type of student. While the population of students at the Air Force Academy may be considered a heterogeneous population representing all 50 states, and a cross-section of socio-economic backgrounds, they are homogeneous in the sense that they have excelled academically and athletically, and they are committed to becoming military officers.

Third, there is the obvious limitation of duration of the study. As mentioned in Chapter 3, this study took a "snap-shot" look at two different pre-writing activities and then compared compositions following each of these activities. This may have reduced the possibility of finding significant differences in the outcomes between the two groups. Curiously enough, even the subjects themselves recognized the need for more time to work with the two programs. In the words of one student, "A few more days would have showed more improvement." An enhanced research design would include a longitudinal study over the course of a semester, a year, or even several years of a foreign language sequence. It is possible that over time greater differences would emerge in written compositions produced after collaborative, computer-mediated discussion, or non-collaborative, writing skills practice.

A fourth limitation of the study is the use of computerized text analysis for the assessment of several of the dependent variables. As mentioned in Chapter 3, the program used to determine grammatical accuracy (*Grammatik*) was unable to distinguish between a simple spelling error and a morphological mistake. (Also noted in Chapter 3

was the fact that even with human intervention, it would often be impossible to distinguish incorrect verb endings, as an example, as spelling errors or grammatical mistakes.) Therefore, spelling errors detected by the grammar checker were included in the total number of grammatical errors found for each composition. This may be considered a weakness due to the inability to differentiate between the data from a subject with simple spelling problems and the data from a subject with more serious grammatical deficiencies.

Similarly, the computer text analysis program used in this study was limited in its ability to analyze certain features of syntactic complexity. Although a number of second language research studies commonly use T-units in determining syntactic complexity (Gaies, 1980; Larsen-Freeman, 1983), because of software limitations, this was not possible in the present study. Sentence-based features, such as total number of coordinating conjunctions, total number of subordinating conjunctions and total number of sentences for each composition formed the basis of the syntactic complexity variable. This may be considered a weakness in that the formula used to calculate syntactic complexity may not accurately represent the level of syntactic development for each composition.

Recommendations for future research

Based on the findings, implications and limitations of this research study, it is obvious that there is a need for continued research on the use of collaborative computer-mediated communication and non-collaborative writing skills practice in foreign language learning

situations. Suggestions for future research will be addressed under the following subheadings: sample size, timeframe, age, proficiency level, type of learning institution, other languages and personality types.

Sample size: In order to analyze a large number of independent variables, it would be necessary to have a much larger sample size than the one used in this study. A large sample would also provide the variability of individual differences desirable for quantitative second language research projects.

Timeframe: An enhanced research design might include a longitudinal study over the course of a semester, an academic school year, or a four-year language learning sequence. This would enable the researcher to investigate the possibility of developmental differences due to the use of computer-mediated communication or computer-assisted writing skills practice.

Age: This study used 42 subjects who were all between the ages of 19 and 21. An expanded research design might include a broad range of ages in order to address the role of age in computer-based language learning activities.

Proficiency level: This study used intermediate/advanced university-level students enrolled in French classes at the U.S. Air Force Academy. All students had completed (or validated) a full year of university-level French instruction, and were currently

enrolled in the fourth or fifth semester of the French curriculum. It would be interesting

to investigate the performance of beginners in both the computer-mediated discussions

and the computer-assisted writing skills practice. Due to their proficiency levels, subjects

in this particular study were able to engage in "written" discussions for a full 45 minutes.

It may be necessary to adjust the amount of time devoted to this activity if students with

lower proficiency levels were unable to actively participate throughout the session.

Future research might also include subjects of different proficiency levels

participating in the same activities. While the intermediate/advanced subjects in this

study were discouraged by the limited vocabulary bank available through *Système-D*, this

might not be the case for beginning learners of French. As for CMC, 14% of the

respondents to the attitude questionnaire felt that "classmates were not helpful during

interactions because they were all at a similar proficiency level." Students did not feel

that their classmates were able to provide vocabulary, expressions or grammatical terms

beyond their own, very similar, levels of proficiency. Perhaps a mix of proficiency

levels, including beginners with intermediates, intermediates with advanced, and

instructors with students would yield interesting results. Future research might also

include a mix of native and non-native speakers of French. This would most likely

eliminate the perception by non-native speakers that the quality of input was insufficient

for learning.

Type of learning institution: This study was conducted at the United States Air Force

Academy, using military cadets as subjects. Due to the unique population of students, as

well as the military context in which the students live, findings from this study are generalizable only to similar students in similar contexts. Future research should include the investigation of the effects of computer-mediated discussions and computer-assisted writing skills practice in other military/Department of Defense settings, such as the other service academies, the Defense Language Institute, and the Foreign Service Institute, and at a variety of civilian settings, including grade schools, high schools, community colleges, 2-year and 4-year colleges, and public as well as private institutions.

Other languages: Learners in this study were all native speakers of English enrolled in intermediate/advanced university-level French courses. An expanded research design might explore the performance of learners studying second languages other than French, as well as the performance of learners who are not native speakers of English.

Personality types: Due to the small sample size and the need to reduce independent variables for statistical analysis, this study was limited to the investigation of two scales of the MBTI: (1) the Extraversion/Introversion scale, and (2) the Thinking/Feeling scale. The unique population of students chosen for this study also led to a slightly larger percentage of extraverts than introverts, and a much larger percentage of thinkers than feelers. Future research should include the investigation of all four scales of the MBTI, and if at all possible, an equitable representation of personality types. Future research might also include other aspects of personality addressed in previous second language

research such as risk-taking (Ely, 1986) and anxiety (MacIntyre & Gardner, 1991; Young, 1991; Horwitz, Horwitz & Cope, 1986).

Conclusion

Having discussed the findings and implication for each research question, as well as the limitations and suggestions for future research, it is important to now take a look at the broader aspects of SLA theory and pedagogy affected by this study. This study is similar to many other research studies in the field of second language acquisition in that it does not provide definitive answers to the complex questions of language learning. It does, however, provide the basis for making suggestions as to the implications on recent SLA theory and pedagogy.

As outlined in Chapter 1, one of the recent approaches used in second language acquisition research concerning discourse interaction theory focuses on comprehensible input, developed extensively as part of Krashen's Input Hypothesis (1985, 1989). Results from this study did not confirm or deny Krashen's Input Hypothesis. This is mainly due to the fact that Krashen's theory is "unfalsifiable" (Larsen-Freeman, 1991, p. 225). Without precise definitions of the terms "i" or "i + 1," there is no way of knowing whether an activity, such as computer-mediated communication, provides students with the comprehensible input considered essential for second language development. The Input Hypothesis also fails to define the precise nature of the affective filter. While it seems intuitively obvious to language instructors that students will learn better in a

relaxed, friendly environment, once again there is no way to prove experimentally the existence of an "affective filter," let alone whether it is "up" or "down."

Results from this study may, however, have implications for interaction theory. The basic claim of Discourse Interaction Theory is that negotiations for meaning lead to subsequent modifications of a learner's interlanguage, and therefore are essential to language development. Allwright (1984, p. 156) went so far as to suggest that interaction is "the fundamental fact of classroom pedagogy." In contrast with both the basic tenet of the theory as well as widespread beliefs about the importance of interaction, results from this study lead one to believe that interaction alone may not be the key to better writing. In addition, all students may not prefer intensive interaction with their peers. There may be a certain population (perhaps Thinkers) that benefits more from non-collaborative data collection in a context of non-interactive computer-based work.

It is certainly not the researcher's intent to suggest that interaction in writing or any of the other basic language skills does not have a place in the second language learning curriculum. This study implies that a multiplicity of approaches is desirable. This study showed that students benefited from both types of pre-writing activities. As mentioned previously, the computer-mediated discussion group had the benefits of interaction and increased target language production, while the computer-assisted writing skills group benefited from access to a computerized data base of grammar, vocabulary and phrases for their compositions. Neither group, however, did substantially better on their compositions (in terms of total number of words, lexical diversity, lexical density, syntactic complexity, overall quality, or grammatical accuracy). While subjects in this

study favored the writing skills practice over the computer-mediated discussions, overall they had positive attitudes towards *both* computer-based activities. If favorable attitudes towards classroom activities lead to increased motivation, which in turn positively affects second language development (as suggested by Crookes & Schmidt, 1991; Dornyei, 1994; Gardner, 1988a; Oxford & Shearin, 1994), it follows that similar activities have tremendous potential in achieving such desirable outcomes.

Appendix A

Sample of *Système-D* Instructions

Système-D session #1

PURPOSE: This activity is intended to prepare you for an in-class composition assignment on Thursday, 29 Jan. The composition task will be to write a letter to your new French-speaking pen-pal, telling him/her something about you and your family, and finding out a little about him or her.

DIRECTIONS: You have 45 minutes to complete the following activity. Use *Système-D* to look up the PHRASES, GRAMMAR and VOCABULARY (listed under Reference on the toolbar) suggested below. Feel free to browse through any categories relevant to the task to best use the time allotted. TAKE WHATEVER NOTES YOU WISH DURING THIS ACTIVITY. You may use the notes to help you write a composition during your next class session. Your notes will be collected at the end of this class and returned to you at the start of your next class.

TOPIC: Introductions

Tasks:

1. Discuss personal information including your age and where you are from.
   GRAMMAR: e.g., Prepositions *à, en* with places: *Avoir* expressions

2. Describe your family members (i.e. number of brothers and sisters), and your parents' professions.
   GRAMMAR: e.g., Possessive adjectives
   VOCABULARY: e.g., Family members, professions

3. Discuss your personality; your likes and dislikes.
   VOCABULARY: e.g., Personality
   GRAMMAR: e.g., Verb + infinitive
   GRAMMAR: e.g., Negation with *ne ... pas;* Verb + infinitive

4. Ask questions about someone else's likes and dislikes.
   GRAMMAR: e.g., Interrogative *est-ce que*; Interrogative adverbs

5. Discuss your major and what you like to do in your free time.
   GRAMMAR: e.g., *Faire* expressions
   VOCABULARY: e.g., Studies, Sports, Leisure

Appendix B
Note Sheets

Name _____   **NOTES**
Student I.D. # _____

1.

2.

3.

4.

5.

Additional Notes:

Appendix C
Sample of CMC Instructions

CMC Session #2

PURPOSE: This activity is intended to prepare you for an in-class composition assignment on Thursday, 12 Feb. The composition task will be to write a text for a travel brochure for foreign visitors in your city.

DIRECTIONS: You have 45 minutes to complete the following activity. Discuss in as much detail as possible either your hometown, or any other city that you are familiar with. Feel free to ask any questions, or give any information relevant to the task to best use the time allotted. **YOU WILL BE GIVEN A HARD COPY OF THE SCRIPT PRODUCED BY YOUR GROUP AT THE START OF YOUR NEXT CLASS. You may use the script to help you write a composition during your next class session.**

TOPIC: Description of a place

Suggestions for discussion:

1. Give your groupmates reasons why they should visit your hometown.

2. Talk about places of interest/main attractions for someone who is not familiar with your hometown.

3. Make suggestions about where someone might like to eat, and explain why.

4. Compare your hometown with another city mentioned by your groupmates.

5. Talk about things to do for entertainment in your hometown.

Appendix D
Practice Session Instructions for the Computer-mediated Communication Group

CMC practice session

PURPOSE: The purpose of this activity is to familiarize you with CMC.

DIRECTIONS: You have 20 minutes to complete the following activity. Interact with other participants in your group about the information requested below. Feel free to ask any questions, or give any information relevant to the task to best use the time allotted. **TAKE WHATEVER NOTES YOU WISH DURING THIS ACTIVITY.**

TOPIC: Sports

Suggestions for discussion:

1. Find out from the other participants in your group what recreational sports they like to engage in.

2. Make suggestions on a sporting activity you could do together.

3. Agree to a time and place you could meet for the sporting activity.

Appendix E
Practice Session Instructions for the *Système-D* Group

Système-D **practice session**

PURPOSE: The purpose of this activity is to familiarize you with *Système-D*.

DIRECTIONS: You have 20 minutes to complete the following activity. Use *Système-D* to look up the PHRASES, GRAMMAR and VOCABULARY (listed under Reference on the toolbar) suggested below. Feel free to browse through any categories relevant to the task to best use the time allotted. TAKE WHATEVER NOTES YOU WISH DURING THIS ACTIVITY.

Tasks:

1. Ask questions about someone else's likes and dislikes concerning recreational sports.
   GRAMMAR: e.g, *Faire* expressions; Interrogative *est-ce que*; Interrogative adverbs; Verb+ *à* + Infinitive
   VOCABULARY: e.g., Sports

2. Make suggestions for a sporting activity you could do with someone else.
   PHRASES: e.g., Expressing an opinion; Persuading

3. Set a time and place to meet with someone else for this sporting activity.
   VOCABULARY: e.g., Time expressions; Time of day
   PHRASES: e.g., Making an appointment; Inviting; Accepting and declining

Appendix F
Accent Guide

LES ACCENTS FRANCAIS A L'ORDINATEUR

Pour utiliser les voyelles accentuées sur votre ordinateur, faites ce qui suit:

1) Appuyer sur la touche "Num Lock" et laissez-la éclairée.

2) Appuyer sur la touche Alt (et simultanément sur les touches numériques),

3) Tapez les numéros suivants:

128	=	Ç		135	=	ç
130	=	é		140	=	î
138	=	è		139	=	ï
136	=	ê		147	=	ô
137	=	ë		150	=	û
131	=	â		151	=	ù
133	=	à				

Vous pouvez utiliser cette méthode avec EMAIL, MAILMAN, et Word for Windows.
Vous pouvez aussi vous référez au HELP du logiciel Microsoft Word sous la rubrique
accents.

Appendix G
Instructions for Composition #1 and Composition #2

Composition #1 Directions: Write a letter of introduction IN FRENCH to your new French-speaking pen-pal, telling him/her something about you and your family, and finding out a little about him or her. Be sure to address the following information:

(1) your name, age and where you are from,
(2) the members of your family, and what your parents do for a living,
(3) your personality; your likes and dislikes,
(4) a question about your pen-pal's likes and dislikes,
(5) your major and what you like to do in your free time.

You may use the notes or the scripts that you produced during your last class.

You have 45 minutes to complete the very best composition of which you are capable.

Composition #2 Directions: Write a text for a travel brochure IN FRENCH for foreign visitors in your city. Be sure to address the following information:

(1) reasons why someone should visit your hometown,
(2) places of interest/main attractions for someone who is not familiar with your hometown,
(3) suggestions about where someone might like to eat, and explain why,
(4) comparison of your hometown with another city you are familiar with,
(5) suggestions for things to do for entertainment.

You may use the notes or the scripts that you produced during your last class.

You have 45 minutes to complete the very best text of which you are capable.

Appendix H
Background Questionnaire

Name:

Student I.D. #:

# of years spent learning French (circle one): 0-1   2-3   4-5   6-7   over 7

Why are you taking French?

Other than homework for French class, do you spend time outside of class reading, writing, speaking, or listening to French? If so, please describe the circumstances.

Have you ever visited or lived in a French-speaking country? If so, which country and for how long?

How much experience do you have using computers for word processing? (circle one)
0-1 years   2-3 years   4-5 years   6-7 years   8-9 years   over 9 years

How much experience do you have using computers for e-mail messages? (circle one)
0-1 years   2-3 years   4-5 years   6-7 years   8-9 years   over 9 years

Have you had any experience in computer conferencing, such as participation in chat rooms, MUD's or MOO's? If so, please describe.

Appendix I
Attitude Questionnaire

NAME:_____

Directions: Please answer the following questions based on your recent experiences with CMC and *Système-D*. The information you provide will be used **for research purposes only,** and will not affect your grade in any way. Use the scale below to answer the first 20 questions. **Mark your scantron accordingly.**

CMC = Computer-mediated communication (i.e. computer conferencing)

1. I participated enthusiastically in the CMC writing activities.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

2. I believe that CMC activities helped me to write a better composition.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

3. I enjoyed the opportunity to interact with my classmates during CMC activities.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

4. I enjoyed working independently with *Système-D*.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

5. I am more confident about my writing skills due to the use of *Système-D*.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

6. I did not see any advantage to taking notes during CMC activities.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

7. I feel CMC should be used more often in class.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

8. I participated enthusiastically in *Système-D* activities.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

9. I enjoyed the self-paced nature of writing during CMC activities.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

Appendix I (continued)

10. I believe that using *Système-D* helped me to write a better composition.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

11. I did not enjoy interacting with my classmates during CMC activities.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

12. I was able to obtain useful information while working with *Système-D*.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

13. I was more motivated to write a composition after participating in CMC.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

14. I feel *Système-D* should be used more often in class.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

15. I am more confident about my writing skills due to participation in CMC.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

16. I considered it beneficial to take notes while using *Système-D*.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

17. I experienced technical difficulties while working with CMC.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

18. I experienced technical difficulties while working with *Système-D*.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

19. I was more motivated to write a composition after using *Système-D*.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

20. I did not obtain useful information while participating in CMC.
A. strongly agree   B. agree   C. somewhat agree   D. somewhat disagree   E. disagree   F. strongly disagree

Appendix I (continued)

Please use the spaces below, or the attached blank sheet to answer the following questions.

21. What I liked best about CMC was:

22. What I liked least about CMC was:

23. What I liked best about *Système-D* was:

24. What I liked least about *Système-D* was:

25. Did you have sufficient time to interact during CMC before writing a composition? If not, please explain.

26. Did you have sufficient time to use *Système-D* before having to write a composition? If not, please explain.

27. Did you have sufficient time to write your composition? If not, please explain.

28. Any additional comments?

Appendix J
Analytic Scoring Scale

Content 27-30   *Excellent to very good*: knowledgeable; substantive; thorough
development of thesis; relevant to topic assigned.

22-26   *Good to average*: some knowledge of subject; adequate range; limited thematic
development; mostly relevant to topic, but lacks detail.

17-21   *Fair to poor*: limited knowledge of subject; minimal substance; poor thematic
development.

13-16   *Very poor*: shows little or no knowledge of subject; inadequate quantity; not
relevant, or not enough to rate.

Organization   18-20   *Excellent to very good*: fluent expression; clear statement of
ideas; solid support; clear organization; logical and cohesive sequencing.

14-17   *Good to average*: adequate fluency; main ideas clear but loosely organized;
supporting material limited; sequencing logical, but incomplete.

10-13   *Fair to poor*: low fluency; ideas not well connected; logical sequencing and
development lacking.

7-9   *Very poor*: ideas not communicated; organization lacking or not enough to rate.

Grammar   22-25   *Excellent to very good*: accurate use of relatively complex
structures; few errors in agreement, number, tense, word order, articles,
pronouns, prepositions.

18-21   *Good to average*: simple constructions used effectively; some
problems in use of complex structures; errors in agreement, number, tense, word
order, articles, pronouns, prepositions.

11-17   *Fair to poor*: significant defects in use of complex constructions; frequent errors
in agreement, number, tense, negation, word order, articles, pronouns,
prepositions; fragments and deletions; lack of accuracy interferes with meaning.

5-10   *Very poor*: no mastery of simple sentence constructions; text dominated by
errors; does not communicate, or not enough to rate.

Vocabulary   18-20   *Excellent to very good*: complex range; accurate word/idiom
choice; mastery of word forms; appropriate register.

14-17   *Good to average*: adequate range; errors of word/idiom choice;
effective transmission of meaning.

10-13   *Fair to poor*: limited range; frequent word/idiom errors;
inappropriate choice, usage; meaning not effectively
communicated.

7-9   *Very poor*: translation-based errors; little knowledge of target
language vocabulary, or not enough to rate.

Appendix J (continued)

Mechanics	5	*Excellent to very good*: masters of conventions of spelling, punctuation, capitalization, paragraph indentation, etc.
	4	*Good to average*: occasional errors in spelling, punctuation, capitalization, paragraph indentation, etc., which do not interfere with meaning.
	3	*Fair to poor*: frequent spelling, punctuation, capitalization, paragraphing errors; meaning disrupted by formal problems.
	2	*Very poor*: no mastery of conventions due to frequency of mechanical errors, or not enough to rate.
Total	___/100	

Taken from Hedgecock and Lefkowitz, Collaborative Oral/Aural Revision in Foreign Language Writing Instruction, Journal of Second Language Writing, 1(3): 255-276, 1992.)

Appendix K
Holistic Scoring Scale

Demonstrates Superiority	9	*Strong* control of the language; proficiency and variety in grammatical usage with few significant errors; broad command of vocabulary and of idiomatic language.
Demonstrates Competence	8 7	*Good* general control of grammatical structures despite some errors and/or some awkwardness of style. Good use of idioms and vocabulary. Reads smoothly overall.
Suggests Competence	6 5	*Fair* ability to express ideas in target language; correct use of simple grammatical structures or use of more complex structures without numerous serious errors. Some apt vocabulary and idioms. Occasional signs of fluency and sense of style.
Suggests Incompetence	4 3	*Weak* use of language with little control of grammatical structures. Limited vocabulary. Frequent use of anglicisms, which force interpretations on the part of the reader. Occasional redeeming features.
Demonstrates Incompetence	2 1	*Clearly unacceptable* from most points of view. Almost total lack of vocabulary resources, little or no sense of idiom and/or style. Essentially translated from English.
Floating point		A one-point bonus should be awarded for a coherent and well-organized essay or for a particularly inventive one.

(Taken from Johnson's *Grading the Advanced Placement Examination in French Language*. Princeton, NJ: Advanced Placed Program of the College Board, 1983.)

Appendix L
Stop-list

À, À MOINS QUE, D ABORD, AFIN QUE, AILLEURS, D AILLEURS, PAR
AILLEURS, AINSI, AINSI QUE, ALENTOUR, ALORS, ALORS QUE, ASSEZ,
AUPARAVANT, AUPRÈS DE, AUQUEL, À LAQUELLE, AUSSI, AUSSI BIEN
QUE, AUSSITÔT, AUSSITÔT QUE, AUTANT, AUTOUR DE, AUTRE, AUTREFOIS,
AUXQUELS, AUXQUELLES, AVANT, AVANT QUE, EN AVANT, AVEC, EN BAS,
EN BAS DE, BEAUCOUP, BIEN DE, BIEN DES, BIEN QUE, BIEN SÛR, BIENTÔT,
CA, ÇA, CAR, C EST, CE, CET, CETTE, CECI, CELA, CELUI, CELLE, CEUX,
CELLES, CELUI-CI, CELLE-CI, CELUI-LÀ, CELLE-LÀ, CEUX-CI, CELLES-CI,
CEUX-LÀ, CELLES-LÀ, CEPENDANT, CES, CHACUN, CHACUNE, CHEZ, CI-, CI-
APRÈS, CI-CONTRE, CI-DESSOUS, CI-DESSUS, CI-JOINT, COMBIEN DE,
COMME, DANS, DE, DE SORTE DE, DEBOUT, DEDANS, DEHORS, DÉJÀ,
AU DELÀ DE, PAR DELÀ, DEPUIS, DEPUIS QUE, DERNIER, DÈS QUE,
DÉSORMAIS, DESQUELS, DESQUELLES, DESSOUS, AU DESSOUS DE, DU
DESSOUS, DESSUS, AU DESSUS DE, DE DESSUS, EN DESSUS, DONC, DONT,
CE DONT, DORÉNAVANT, DUQUEL, DE LAQUELLE, EN MÊME TEMPS QUE,
ENFIN, ENVERS, ET, EN HAUT, EN HAUT DE, HORMIS, HORS DE, ICI, JUSQU
À, JUSQU À CE QUE, JUSTE, LÀ, LÀ-BAS, LEQUEL, LOIN, LOIN DE LÀ,
LOINTAIN, LONG, LONGUE, LONGTEMPS, LORS DE, LORSQUE,
MAINTENANT, MAINTENANT QUE, MAIS, MAIS OUI, MALGRÉ, MÊME,
MOINS, OU, OÙ, PAR, PAR CONTRE, PAR HASARD, PARCE QUE, PARFOIS,
PARMI, PARTOUT, PARTOUT OÙ, PENDANT LE TEMPS QUE, PENDANT QUE,
PLUPART, PLUS, PLUSIEURS, PLUTÔT, PLUTÔT QUE, POUR, POUR QUE,
POURQUOI, POURTANT, POURVU QUE, PRÈS, PRESQUE, PROCHAIN, PUIS,
PUISQUE, QUAND, QUAND MÊME, QUANT À, QUASIMENT, QUE, CE QUE,
QUEL, QUELCONQUE, QUELQUE, QUELQUEFOIS, QUELQUES, QUELQUE
CHOSE, QUELQU UN, QUELQU UNE, QUELQUES-UNS, QUELQUES-UNES, QUI,
CE QUI, QUICONQUE, QUOI, QUOI QUE, QUOI QUE SE SOIT, QUOIQUE, SANS,
SANS ÇA, SANS QUOI, SAUF, SELON, SELON QUE, SI, SINON, SINON QUE,
SITÔT QUE, SOI, SOUS, SUR, SURTOUT, TANDIS QUE, TEL, TELLE, TEL QUE,
TEL QUEL, TELLEMENT, TELLEMENT DE, TOUJOURS, TOUT, TOUT À COUP,
TOUT À FAIT, TOUT À L HEURE, TOUT DE MEME, TOUT LE MONDE,
TOUTEFOIS, VERS, UN, UNE, LE, LA, L, LES, DES, TOUTE, TOUS, TOUTES,
QUELLE, QUELLES, QUELS, TOUS LES DEUX, TOUT LE MONDE, PEU,
PERSONNE, AUCUN, AUCUNE, RIEN, CERTAINS, JE, J, TU, IL, ELLE,
NOUS, VOUS, ILS, ELLES, ON, MOI, TOI, LUI, ELLE, NOUS, VOUS, EUX, ELLES,
MOI-MÊME, TOI-MÊME, LUI-MÊME, ELLE-MÊME, NOUS-MÊME, VOUS-MÊME,
EUX-MÊME, ELLES-MÊME, ME, T, TE, S, SE, MON, MA, MES,

Appendix L (continued)

TON, TA, TES, SON, SA, SES, NOS, VOS, MIEN, TIEN, SIEN, NÔTRE, VÔTRE,
NOTRE, VOTRE, LEUR, MIENNE, TIENNE, SIENNE, MIENS, TIENS, SIENS,
NÔTRES, VÔTRES, LEURS, MIENNES, TIENNES, SIENNES, ENCORE, IL Y A,
N IMPORTE OÙ, EN ARRIÈRE, D AUTRE, D AUTRES, JAMAIS, PAR
CONSÉQUENT, QUELQUE PART, AUJOURD HUI, DEMAIN, TRÈS, OUI, HIER,
AU SUJET DE, APRÈS, LE LONG DE, VERS LE BAS, NI, À TRAVERS,
MILLIARD, HUIT, DIX-HUIT, HUITIÈME, DIX-HUITIÈME, QUATRE-VINGTS,
ONZE, ONZIÈME, QUINZE, QUINZIÈME, CINQUIÈME, CINQUANTE, PREMIER,
CINQ, QUARANTIÈME, QUARANTE, QUATRE, QUATORZE, QUATORIÈME,
QUATRIÈME, CENT, CENTIÈME, DERNIER, MILLE, PROCHAIN, NEUF, DIX-
NEUF, DIX-NEUVIÈME, QUATRE-VINGT-DIX, UNE FOIS QUE, UN, EN SECOND
LIEU, SEPT, DIX-SEPT, DIX-SEPTIÈME, SEPTIÈME, SOIXANTE-DIXIÈME,
SOIXANTE-DIX, SIX, SEIZE, SEIZIÈME, SIXIÈME, SOIXANTIÈME, SOIXANTE,
DIX, DIXIÈME, TROISIÈME, TREIZE, TREIZIÈME, TRENTIÈME, TRENTE,
MILLIÈME, TROIS, TROIS FOIS, DOUZIÈME, DOUZE, VINGTIÈME,
VINGT, DEUX FOIS, DEUX, DEUXIEME, DEUXIÈME, APRES, APRÉS, AUTRES,
AUX, C, NE, GUÈRE, NI, NUL, NULLE, POINT, RIEN, TRES, TRÉS, PAS, APRÉS,
CHAQUE, N, DEUXIÈME, PRES, PRÈS, PRÉMIERE, PREMIÈRE, QU

Appendix M
Multiple Regression Results using Forced Entry for the Independent Variables

Table M1. Multiple Regression results for Total Words 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	.01806	.273	.7862			
WISC		.758	.4535			
GPA		-.368	.7154			
E/I		.277	.7834			
T/F		1.412	.1667			
CMC/SD		-1.676	.1027			

Note. The level of α is set at .05 and the sample size (N) is 42.

Table M2. Multiple Regression results for Lexical Diversity 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	.04569	-.290	.7735			
WISC		-.025	.9806			
GPA		-.050	.9607			
E/I		-.345	.7320			
T/F		-1.764	.0865			
CMC/SD		1.933	.0613			

Note. The level of α is set at .05 and the sample size (N) is 42.

Table M3. Multiple Regression results for Lexical Density 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	.05012	.128	.8990			
WISC		.381	.7057			
GPA		-.460	.6481			
E/I		-.477	.6365			
T/F		**-2.475**	**.0183**			
CMC/SD		1.317	.1964			

Note. The level of α is set at .05 and the sample size (N) is 42.

Appendix M (continued)

Table M4. Multiple Regression results for Syntactic Complexity 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	-.05376	.567	.5741			
WISC		.084	.9335			
GPA		.148	.8835			
E/I		-1.319	.1956			
T/F		.419	.6776			
CMC/SD		.790	.4350			

Note. The level of α is set at .05 and the sample size (N) is 42.

Table M5. Multiple Regression results for Quality 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	.28128	-.252	.8025			
WISC		**3.917**	**.0004**			
GPA		-1.313	.1976			
E/I		.648	.5214			
T/F		-1.330	.1921			
CMC/SD		.214	.8320			

Note. The level of α is set at .05 and the sample size (N) is 42.

Table M6. Multiple Regression results for Grammar 1

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	.26592	-.825	.4150			
WISC		**-3.405**	**.0017**			
GPA		.381	.7052			
E/I		.422	.6756			
T/F		.375	.7101			
CMC/SD		1.022	.3139			

Note. The level of α is set at .05 and the sample size (N) is 42.

Appendix M (continued)

Table M7. Multiple Regression results for Total Words 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	-.02600	1.189	.2423			
WISC		.294	.7701			
GPA		-.850	.4013			
E/I		.985	.3316			
T/F		.568	.5739			
CMC/SD		-.813	.4215			

Note. The level of α is set at .05 and the sample size (N) is 42.

Table M8. Multiple Regression results for Lexical Diversity 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	-.02863	-.476	.6372			
WISC		.084	.9334			
GPA		.927	.3602			
E/I		-1.295	.2037			
T/F		-.250	.8040			
CMC/SD		1.272	.2119			

Note. The level of α is set at .05 and the sample size (N) is 42.

Table M9. Multiple Regression results for Lexical Density 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	-.14634	-.206	.8380			
WISC		.017	.9864			
GPA		.272	.7869			
E/I		-.240	.8120			
T/F		-.108	.9142			
CMC/SD		.668	.5083			

Note. The level of α is set at .05 and the sample size (N) is 42.

Appendix M (continued)

Table M10. Multiple Regression results for Syntactic Complexity 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	-.02363	.947	.3499			
WISC		.326	.7464			
GPA		.809	.4241			
E/I		-.915	.3666			
T/F		1.027	.3113			
CMC/SD		-.018	.9860			

Note. The level of α is set at .05 and the sample size (N) is 42.

Table M11. Multiple Regression results for Quality 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	.42690	.741	.4634			
WISC		**4.374**	**.0001**			
GPA		-.735	.4670			
E/I		.470	.6410			
T/F		.123	.9025			
CMC/SD		**2.322**	**.0262**			

Note. The level of α is set at .05 and the sample size (N) is 42.

Table M12. Multiple Regression results for Grammar 2

Variables in the Equation				Variables not in the Equation		
	Adjusted R^2	T	Sig. T			
Gender	.25379	-1.921	.0629			
WISC		**-2.040**	**.0490**			
GPA		-.683	.4992			
E/I		.390	.6992			
T/F		-.107	.9153			
CMC/SD		**-2.351**	**.0245**			

Note. The level of α is set at .05 and the sample size (N) is 42.

Appendix N
Percentages of Respondents for Each Possible Answer of the Attitude Questionnaire

I participated enthusiastically in CMC/*Système-D*.

	CMC	*Système-D*
Strongly agree	21.6%	29.7%
Agree	54.1%	45.9%
Somewhat agree	13.5%	21.6%
Somewhat disagree	5.4%	2.7%
Disagree	5.4%	0%
Strongly disagree	0%	0%

Totals	CMC	*Système-D*
Agree	89.2%	97.2%
Disagree	10.8%	2.7%

I believe that CMC/*Système-D* helped me write a better composition.

	CMC	*Système-D*
Strongly agree	5.4%	37.8%
Agree	16.2%	40.5%
Somewhat agree	29.7%	18.9%
Somewhat disagree	21.6%	2.7%
Disagree	21.6%	0%
Strongly disagree	5.4%	0%

Totals	CMC	*Système-D*
Agree	51.3%	97.2%
Disagree	48.6%	2.7%

Appendix N (continued)

I enjoyed the (opportunity to interact during CMC/working independently with Sys-D).

	CMC	*Système-D*
Strongly agree	32.4%	43.2%
Agree	45.9%	35.1%
Somewhat agree	13.5%	13.5%
Somewhat disagree	5.4%	8.1%
Disagree	2.7%	0%
Strongly disagree	0%	0%

Totals	CMC	*Système-D*
Agree	91.8%	91.8%
Disagree	8.1%	8.1%

I am more confident about my writing skills after working with CMC/*Système-D*.

	CMC	*Système-D*
Strongly agree	2.7%	18.9%
Agree	21.6%	27.0%
Somewhat agree	18.9%	35.1%
Somewhat disagree	27.0%	10.8%
Disagree	18.9%	8.1%
Strongly disagree	10.8%	0%

Totals	CMC	*Système-D*
Agree	43.2%	81%
Disagree	56.7%	18.9%

Appendix N (continued)

I considered it beneficial to take notes while using CMC/*Système-D*.

	CMC	*Système-D*
Strongly agree	5.4%	54.1%
Agree	8.1%	37.8%
Somewhat agree	5.4%	5.4%
Somewhat disagree	24.3%	0%
Disagree	29.7%	2.7%
Strongly disagree	27.0%	0%

Totals	CMC	*Système-D*
Agree	18.9%	97.3%
Disagree	81.0%	2.7%

I feel CMC/*Système-D* should be used more often in class.

	CMC	*Système-D*
Strongly agree	13.5%	48.6%
Agree	24.3%	37.8%
Somewhat agree	10.8%	13.5%
Somewhat disagree	27.0%	0%
Disagree	18.9%	0%
Strongly disagree	5.5%	0%

Totals	CMC	*Système-D*
Agree	48.6%	100%
Disagree	51.4%	0%

Appendix N (continued)

I enjoyed the self-paced nature of writing during CMC.

	CMC
Strongly agree	13.5%
Agree	45.9%
Somewhat agree	18.9%
Somewhat disagree	18.9%
Disagree	2.7%
Strongly disagree	0%

Totals	CMC
Agree	78.3%
Disagree	21.6%

I was able to obtain useful information while working with CMC/*Système-D*.

	CMC	*Système-D*
Strongly agree	2.7%	40.5%
Agree	16.2%	51.4%
Somewhat agree	24.3%	5.4%
Somewhat disagree	24.3%	2.7%
Disagree	18.9%	0%
Strongly disagree	13.5%	0%

Totals	CMC	*Système-D*
Agree	43.2%	97.3%
Disagree	56.7%	2.7%

Appendix N (continued)

I was more motivated to write a composition after working with CMC/*Système-D*.

	CMC	*Système-D*
Strongly agree	5.4%	16.2%
Agree	8.1%	37.8%
Somewhat agree	18.9%	35.1%
Somewhat disagree	37.8%	2.7%
Disagree	29.7%	5.4%
Strongly disagree	0%	2.7%

Totals	CMC	*Système-D*
Agree	32.4%	89.1%
Disagree	67.5%	10.8%

I experienced technical difficulties while working with CMC/*Système-D*.

	CMC	*Système-D*
Strongly agree	0%	0%
Agree	0%	0%
Somewhat agree	2.7%	2.7%
Somewhat disagree	5.4%	5.4%
Disagree	48.6%	48.6%
Strongly disagree	43.2%	43.2%

Totals	CMC	*Système-D*
Agree	2.7%	2.7%
Disagree	97.2%	97.2%

Appendix O
Listing of Questionnaire Responses Concerning Students' Likes about CMC and
Système-D

Attitude questionnaire – Responses to the question "What I liked best about CMC"

Interaction	20
Fun	6
Improves conversational French skills	5
Negative responses, such as "didn't like it," "not much," "killed time," and "absolutely nothing"	5
Learning about classmates	2
Able to practice written conversation	2
Anonymous communication	2
Instantaneous communication	1
Added a new dimension to learning French	1
Opportunity to experiment and try writing	1
Able to learn from the way others wrote	1
Helped generate ideas for writing	1
Self-paced	1
Ability to share thoughts and expressions in French	1

Attitude questionnaire – Responses to the question "What I liked best about *Système-D*"

Easy to look things up	17
Learned new vocabulary and grammar	8
Learned new phrases	6
Got helpful information for composition	6
Thorough information source	4
Clear-cut definitions/explanations	2
Everything	2
Able to take good notes	1
Working independently	1
Easy to stay on task	1

Appendix P
Listing of Questionnaire Responses Concerning Students' Dislikes about CMC and
Système-D

Attitude questionnaire – responses to the question "What I liked least about CMC"

Useless to writing	7
Classmates at similar level, and therefore not very helpful	6
Other group member not taking it seriously	4
Speed of the conversation	3
Got no useful information with CMC	3
Did not help with my writing	3
Writing gets "sloppy" due to the speed of the conversation	2
Too much time for chatting	2
Ease of getting off-subject	2
Having to type in accents	1
Topics did not lend themselves well to discussion	1
Boring	1
Did not help learn vocabulary	1
Anonymity	1
One-dimensional conversations	1
Lack of structure or definitive answers	1
Not as helpful as *Système-D*	1
Topic sometimes got lost in the chatter of thoughts by everyone	1
Nothing	1
Not being able to use a dictionary	1

Appendix P (continued)

Attitude questionnaire – Responses to the question "What I liked least about *Système-D*"

Limited vocabulary bank	13
Nothing	10
Wanted to use it while actually writing the compositions	4
Boring	2
Not user-friendly at first	2
Did not offer interaction	2
Didn't give examples of words in sentences	1
Not available to us in our rooms	1
Could not employ the new vocabulary learned in a conversation to see how it would work	1
Not as much fun as CMC	1
Having to take notes	1
Very plain and rather unforgiving	1
Limited time to work with it	1
Took a while to look up the information I needed	1

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